Mekelle University

College of Business and Economics

Department of Management

Determinants of Effective Household Solid Waste Management Practices: the Case of Ambo Town – West Showa Zone

By:

Ashenafi Haile

A thesis

Submitted in Partial Fulfillment of the Requirement for the award of Masters of Art Degree

In

Development Studies (Business and Development)

Advisors:

Bihon kassa (Assistant Professor) – Principal Advisor

Desta kidanu (Msc) – Co Advisor

May 2011

Mekelle, Ethiopia

Declaration

I**,** Ashenafi Haile, hereby declare that the thesis work entitled **"Determinants of Effective Household Solid Waste Management Practice: The Case of Ambo Town – West Showa Zone"** Submitted by me in partial fulfillment of the requirements for the award of the degree of Master of Art in Development Studies (specialized in Business and development) to the College of Business and Economics, Mekelle University, through the Department of Management, is original work carried out by myself. The matter embodied in this thesis work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Name of the student: Ashenafi Haile

Signature: _____

Date:_____

Certification

This is to certify that this thesis entitled **"Determinants of Effective Household Solid Waste Management Practice: The Case of Ambo Town – West Showa Zone"** submitted in partial fulfillment of the requirements for the award of the degree of MA, in Development Studies to the College of Business and Economics, Mekelle University, through the Department of Management, done by Mr. Ashenafi Haile, Id.No. CBE/PR/091/02 is an authentic work carried out by him under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Name of Principal Advisor: Bihon Kassa (Assistant Professor)

Signature: _____

Date: _____

Name of Co – Advisor: Desta Kidanu (Msc)

Signature: _____

Date: _____

Place: Mekelle, Ethiopia

Table of Contents

Contents **Page**

Declaration……..... ii

Certification……. iii

Table contents……. iv

Abstract…… vi

Acknowledgement…….. vii

List of tables…… viii

List of figures…….. ix

Acronyms ……..... x

1 Chapter one: Introduction……..... 1

1.1 Background of the study……..... 1

1.2 Statement of the problem…… 4

1.3 Objective of the study……..... 6

1.3.1 General objective of the study……. 6

1.3.2 Specific objectives of the study……... 6

1.4 Significance of the study…… 6

1.5 Scope of the study……..... 7

1.6 Limitation of the study……..... 7

1.7 Organization of the thesis……..... 7

2 Chapter two: review of related literature……. 8

2.1 Theoretical literatures……. 8

2.1.1 Definitions and concepts……. 8

2.1.2 Types and sources of solid wastes……... 10

2.1.3 Approaches to household solid waste management……..... 11

2.1.4 Problems and challenges of solid waste management…… 14

2.1.5 Key solid waste management strategic issues……. 19

2.1.6 Effects and impacts of solid waste…….. 22

2.2 Empirical literatures…… 23

3 Chapter three: Methodology of the study…… 31

3.1 Description of the study area……. 31
3.1.1 Physical Characteristics of Ambo Town…… 31
3.1.2 Demographic Characteristics…….. 31
3.2 Data type and sources……. 34
3.3 Target population…… 34
3.4 Sample size and sampling procedures……..... 34
3.4.1 Sample size…….. 34
3.4.2 Sampling technique and procedures…… 35
3.5 Data collection techniques and instruments…… 36
3.6 Methods of Data processing and analysis……... 37
3.6.1 Data processing……..... 37
3.6.2 Data analysis……... 38
4 Chapter four: result and discussion…… 44
4.1 Current situation of HHSWM in Ambo…….. 44
4.2 Determinants of Effective Household Solid Waste Management: Descriptive Analysis……..... 49
4.2.1 Demographic factors……... 50
4.2.2 Socio – cultural factors…….. 53
4.2.3 Institutional factors…… 64
4.3 Determinants of Effective Household Solid Waste Management: Econometrics Analysis…….. 71
4.4 Service delivery performance of private solid waste collectors……..... 77
4.4.1 Establishment and progress of private solid waste collectors in Ambo…….. 78
4.4.2 Households' attitude towards door to door waste collectors' service…… 80
4.4.3 Private door to door solid waste collectors' problems and challenges……... 81
5 Chapter five: conclusions and recommendations…… 84
5.1 Conclusions……. 84
5.2 Recommendations……..... 88
Reference…… 91
Appendices…….. 96

Abstract

Most of the developed countries recognized that solid waste management is very crucial for survival (economically) in addition to secure the safety of environment and human health. However, the developing countries like Ethiopia, let alone use its economical benefits, because of various reasons they are dumping of wastes in unauthorized sites, which easily expose to harsh hazards, like environmental pollution and health problem. Hence, the overall objective of the study is to describe and analyze the household solid waste management current situation and examine the influence of demographics, socio-cultural and institutional factors on the effectiveness of solid waste management at household level in the town. The data were collected from 200 households, which were selected through multi-stage sampling from three 'kebelles', from responsible staff and private participants using interviews and focus group discussion respectively. Descriptive statistics and inferential statistics tools such as two-sample t test, Pearson chi-square and correlation were used to know the relationship between variables. Logistic regression model was used to identify factors that determine the effectiveness of solid waste management at household level in the study area. The descriptive findings show that plastic, paper and ash constitute the major waste bulk generated by the households. In addition, there is a positive link between household's income and waste generation. Though all households have temporary storage in their home, they did not store wastes separately based on its nature. Disposed off solid wastes in unauthorized sites by the households is highly practiced in Ambo. The empirical analyses, using the logistic regression model, shows that, household head sex, household head educational level, household's location (distance of residents from the main road or center), household's willingness to pay, household's awareness on solid waste management and household's access to the private waste collectors' service are the major determinants of effective household solid waste management in the study area. Moreover, the qualitative analyses, using the interview and focus group discussion data, show that manpower, budget, and facilities such as container, adequate vehicles, waste gown, and gloves are the other major determining factors of effective solid waste management at household level in Ambo.

Key words: Household Solid Waste Management, Private Waste Collectors, Logit, Ambo, West – Showa Zone

Acknowledgement

Above all, I would like to express my sincere thanks to the Almighty God for his inexpressible gifts and love. Next to him, I thank his mother Saint Mary who is an eternal torch of guidance and knowledge for the whole humankind. She prays, blesses, protects and intercedes for us sinners. I take this opportunity to express my indebtedness to all those who have extended their help to me in getting it ready. To begin with, my sincere appreciation goes to my principal and co-Advisor, Bihon Kassa (Assistance Professor) and Desta Kidanu (Msc) respectively, who have been very understanding, kind enough, and most importantly, very accessible to devote part of their precious time to respond to all my frequent inquiries from the inception to the end of my study.

I would also like to extend my gratitude for the town's greenery and beautification sector employees who spent their precious time to discuss honestly about the overall practice of household solid waste management in the town through interview. I am grateful to the residents of the study sites who gave me their precious time to answer the questionnaire.

My grateful also goes to Dr. Sintayoh Fissha, Abebe Ejigu (PhD candidate), Habtamu Ashagrie and Almtsehay Jima for their precious time to read and provide me with valuable comments, especially they spent time to read and comment my proposal. It is quite reasonable to once again acknowledge Dr. Sintayoh Fissha. She took a lot time to patiently review my thesis and provide me with really valuable comments. My deepest gratitude also goes to my friends; Melese Alemayehu, Yibeltal Ayalew, Asnake Werku and all office No. 14 accounting staff for their encompassing supports. In addition, my heartfelt gratitude also goes to Jimma University for allowing me the scholarship to go on with my study.

Finally, my warm thanks and love also go to my family, especially Tangut Emrie, Melkam Haile, Belaynesh Waktola and Gedlu Haile. It would not be justified if I do not mention again and again the support of Tangut Emrie (my special mother). It could have been very tricky to bring my progress/success to where it is now, had it not been for the support I got from her. You are my special gift from God. **Please be alive whenever; I will always love you and remain gratitude to you!**

Ashenafi Haile; May 2011

List of Tables

Tables		Page
Table 2.1:	Sources and types of solid wastes…….....	10
Table 3.1:	Total households that are selected as a sample ……....	36
Table 3.2:	Summary of explanatory variables and hypotheses……...	43
Table 4.1:	Solid waste storage materials at household level……...	45
Table 4.2:	Residential area and the accessibility of private waste collectors……..	47
Table 4.3:	The time of disposal that the household prefer to dispose their solid wastes….	48
Table 4.4:	Descriptive statistics for household's demographic characteristics……...	50
Table 4.5:	Household's awareness and their attitude towards solid waste……..	56
Table 4.6:	Solid waste separation practice at household level……	58
Table 4.7:	The reason why the households apply waste separation at source…….	58
Table 4.8:	Solid waste related information or orientation……...	59
Table 4.9:	The way how households got solid waste related information/orientation……	60
Table 4.10:	Household's awareness about regulation and its enforceability……	64
Table 4.11:	Logit result…….	72
Table 4.12:	Marginal effect result…….	73

List of Figures

Figures		Page
Figure 2.1:	Schematic diagram showing the conventional approach to solid waste management…….	12
Figure 2.2:	Schematic diagram showing the community based approach to solid waste management…….	14
Figure 2.3:	Conceptual frameworks for analysis……	30
Map 3.1:	Geographical map of the study area…….	33
Figure 4.1:	Alternative sites of households to dispose their wastes……	46
Figure 4.2:	The relation between distance from resident to center and effective solid waste management……	55
Figure 4.3:	What solid waste mean for you?.....	57
Figure 4.4:	Household's willingness to pay for solid waste collection services…….	63

List of Acronyms

CBOs	Community Based Organizations
CED	Centre for Environment and Development
ENPHO	Environment and Public Health Organization
HH	Household
HHSWM	Household Solid Waste Management
ILO	International Labor Office
MSWM	Municipal Solid Waste Management
NGOs	Non-Governmental Organizations
SMSWG	Sandec's Municipal Solid Waste Group
SWM	Solid Waste Management
UNESC	United Nations Economic and Social Council
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Human and the act of production and consumption are always inseparable and in the process of utility maximization procedure there is unexpected externalities, waste. The wastes could be both solid and liquid types; and the way they are going to be handled, stored, and disposed can expose the environment and public health to risks (Zhu et al., 2008).

Rouse (2008) noted that "Solid waste is defined as material which no longer has any value to its original owner, and which is discarded. The main constituents of solid waste in urban areas are organic waste (including kitchen waste and garden trimmings), paper, glass, metals and plastics. Ash, dust and street sweepings can also form a significant portion of the waste".

Hundred and thousand years ago, the solid waste management system was not a big deal in the globe. One of the studies related to this stated that "The first humans did not worry much about waste management; rather they simply left their garbage where it dropped" (Net Industries, 2010). This implies that solid waste management task is becoming a serious concern due to the alarmingly increasing rate of population growth and the development of urbanization in the world. This is also supported by Smith (2003). He stated that as far as humans have been living in settled communities, solid waste become an issue, and modern people generate by far more wastes than early humans ever did.

Therefore, the urbanization and population growth rate of a particular city/ nation is positively related with the generation rate of solid wastes. Hence, the city which shows increasing population growth and its urbanization should take the question of how to manage solid wastes without scarifying environmental and human health as an agenda.

According to Rouse (2008) **"**Solid waste management (SWM) involves the collection, storage, transportation, processing, treatment, recycling and final disposal of waste. Systems need to be simple, affordable, and sustainable (financially, environmentally and socially) and should be

equitable, providing collection services to poor as well as wealthy households". To achieve the above stated means of management, household members of a given geographical territory, as one of the stakeholders, have their own responsibility. But the extent of their responsibility is varies depending on the approach that the town follows: either conventional based approach or community based approach (World Bank, 2000; Rahman, 2005); i.e. collection of wastes on temporary storage at the source and dump it on the given municipality material (conventional approach) or handover to the waste collectors (community based approach) is the responsibility of the households of a given area. Hence, these SWM approaches have an advantage to protect the environment from the risk of ineffective disposal system of solid wastes.

Moreover, the primary objective of solid waste management activity is to make the environment sound and safe in human health via disposed off wastes in a well organized manner. However, through process the stakeholders of the management system, especially in the developed nations, did not stop on disposed off waste in open dump or landfill only; rather they tried to convert the trash/solid wastes/ to cash and make strong their economy in addition to environmental aspect. In line with this view, Smith (2003) also stated about the benefit of properly managed solid wastes beyond securing the environment and human health. It is very much worthy to directly quote the finding of Smith: "For most industrialized nations today, solid waste management is a multibillion dollar business which is also crucial to survival. Garbage collection agencies remove tons of garbage yearly and sort it for recycling or ultimate disposal" (Smith, 2003, p: 1).

In addition, Rouse (2008) also noted that, besides the above benefit of well managed solid wastes, it surely is important to produce Methane gas for the purpose of electric power generation.

However, let alone getting the above stated benefits, Solid waste management (SWM) is one of the critical challenges of developing countries including Ethiopia because of the social, economic and environmental implications once not properly managed. One of the studies show that only 30-50% of the waste generated in developing countries is collected and managed properly (Dawit and Alebel, 2003). The rest is either burned or left to decompose in open space or dumped in unregulated landfills, which is damaging the environment. In addition, the study by SMSWG (2008) stated that mostly observed serious problems especially in low and middle income level countries are inadequate collection, storage, treatment and uncontrolled disposal of

solid wastes in open dumps which easily expose to harsh hazards, like environmental pollution and health problem

In recent years, urbanization is increasing in most developing countries including Ethiopia. In addition to the above evidences for the relation of solid waste and urbanization, Studies like Solomon (2006) also showed that a positive relationship between solid waste generation and urban growth. Due to this, the low and middle income countries are really suffering from imbalance between the amount of waste generation and the capacity which need to properly manage their wastes. As per the study conducted by SMSWG (2008), this imbalance is severely affecting the health condition of the society and the general environmental soundness.

The amount of solid waste generation depends on the size of the population and the level of income what each household obtain (Girma, 2004; as cited by Solomon, 2006). It implies that when the population of a given area is increasing, the consumption of certain product will increase along with the waste generated from such consumable product. The same is true for the level of income as well.

According to CSA (1994) census Ambo had a total population of 27,636 which is grown in to a total population of 50,267 (CSA, 2007). This implies that Ambo is also one of the fast growing towns in the country, with increasing solid waste generation.

Moreover, according to preliminary survey conducted by the researcher (August 2010) household solid wastes in Ambo town are observed on the road, burning inside the village and disposed in sewerage. This clearly indicated that, Ambo town population rate and the waste generation rate per household is increasing. But the solid waste management, particularly at household level, is not managed in a well organized manner. This implies that like other developing country cities, Ambo has also problems that prevent the municipality/ responsible body from doing its task for environmental sound with economic efficiency. So that, this research is intended to identify and analyze the main determinants of solid waste management practice at household level.

1.2 STATEMENT OF THE PROBLEM

Urbanization with inadequate waste management practices, specifically, widespread disposal of waste in water bodies, dumping inside the road and uncontrolled dump sites aggravates the problems of generally low sanitation levels across the African countries including Ethiopia (UNESC, 2009).

According to UNESC (2009), the population growth and the rate of urbanization are alarmingly increasing throughout the African continent. But the technology, technical knowhow, financial capacity, culture, and understanding of the community required to properly manage solid wastes are not adequately available. As stated in background of the study, solid waste generation rate in Ambo is increasing along with its population growth rate over time. Related to this Ali (2001) noted that with the increase of population, solid waste management would be the main challenges for the responsible body. So that, preventive measure should be taken in order to have remedial action at least on biodegradable materials. Otherwise, if the present trend of solid waste generation and disposal practices continues, the area would be a place of unhygienic living condition.

As per the result of preliminary survey (pilot study) conducted by the researcher, August 2010, SWM practices of Ambo is under the control of the town municipality. This municipality has a single old truck and also allowing jobless youths to participate in waste management system via door to door collection by their push cart. Then the households are expected to store wastes on their plastic bags or other temporary storage inside the home and hand over to these private waste collectors; (i.e. community based approach). But what is actually observed is different; i.e. there are wastes which are dumped on the road, burning inside the village and throwing in sewerages by the households. It implies that, household solid wastes are not properly managed at source by its generator.

Most studies conducted so far in line with this thesis give more emphasis to the issues like; “willingness to pay” (Aklilu, 2002), “generation rate of the waste” (Lemma, 2007; Melaku, 2008) and even special emphasis given to the “determinants of recycling of solid wastes”; which is revolving on developed nations (Sterner and Bartelings, 1999). But such assessments do not guarantee to conclude about the determining factors of effective solid waste management at

household level. In addition, even though there are some studies which directly or indirectly assessed the constraints of solid waste management, they have reached to different conclusions for similar research issue (Tewodros, 2007; Gebrie, 2009), which necessitated to have further study. It implies that, the studies conducted in other specific area do not guarantee to conclude about the picture of the rest parts of the world, especially at household level. Hence, whether the identified factors are significant or not depend on the existing situation of the given particular area. In other words, the poor performance of each town or nation solid waste management has its own main contextual factors or causes.

Therefore, this thesis is intended to fill the current literature gap related to the motive why the households dispose their wastes improperly, context specific factors of the study area. Moreover, it is also intended to fill the debate of different outcome within the same title. In addition, most of the studies have been conducted at the regional level and sub cities of Addis Ababa - Ethiopia. So that, this work contribute to fill the research gap on SWM existed at zonal level and what factors mostly affecting at this micro level.

On top of these, this type of research has not been ever conducted in the selected area and the municipality also has not filtered or proved information about the problem of solid waste management. Hence, this study was timely to find the real constraints of the household SWM practice of the town and tried to provide feasible solution for the identified problems.

Basic research questions:

By having the above mentioned reasons to do, the following basic research questions were answered by the researcher in the study.

1. What does the current household solid waste management practice of the town look like?
2. How do demographic, socio – cultural and institutional factors affecting solid waste disposal practice of Ambo town at household level?
3. Are the private solid waste collectors performing their given responsibility?

1.3. Objective of the Study

1.3.1 General Objective

The overall objective of the study is to examine the major determinant factors influencing the effectiveness of household solid waste management practice in Ambo Town - West Showa Zone

1.3.2 Specific Objectives

The specific objectives of the study are:

1. To describe the current status of household solid waste management practice in Ambo
2. To analyze and examine the demographic, socio cultural and institutional factors that determine the effectiveness of SWM practice in the town at household level
3. To examine the service delivering performance of private solid waste collectors.
4. To suggest feasible solutions in order to improve household SWM practices in the town

1.4 Significance of the Study

The study is expected to have different benefits. First, as stated on the statement of the problem, research related to this title did not ever conducted in the area (Ambo). So, the researcher believed that, this thesis finding might have a great contribution to make aware the stakeholders regarding the root causes that determining the effective management of domestic solid wastes. Second, as special case the research could also provide the municipality of the town with the current status of the household disposal practice and the main influential factors with scientific evidence. Third, the study is also believed to provide the bench mark for forthcoming interested researcher in the same or related topic in Ambo or at different area. Fourth, the policy makers at national or regional level are expected to draw some lessons in order to design an effective strategy in order to address the problem of solid waste management practice and making the environment sound. Finally, besides to give a good understanding about the general activity of waste management and the problem what the residential facing to the private, NGOs, and the community in general; the result of this thesis will add something new to existing body of knowledge on the subject at current literature.

1.5 Scope of the Study

Of course there are different factors that determine the disposal and management aspect of solid waste at household level, but this thesis delimited to three general factors; namely, demographic factors, institutional factors, and socio – cultural factors.

Even though solid waste management has various stakeholders which have to actively participate on the given task, this study highly concentrated on how the households try to manage their solid waste in the source and what factors they are facing to do so; given that the supply of management facilities and the support of private waste collectors.

1.6 Limitation of the Study

It stated that solid waste management is become the hot issue and the one that encourage the research and development institution across the globe. Especially, in developing nations including Ethiopia, inadequate and inefficient management system of household wastes are observed as the evidence of conducted research. However, due to the time and financial constraints of the researcher, this thesis concentrated on one specific zonal city. Therefore, its output will not represent the solid waste management system of other geographical area.

In addition, even though the solid wastes that can be generated in a given area are various in types, this research focused on the household /domestic/ solid waste management practice. Due to such limitation of the study, the determinant factors that shown in the output of the thesis does not give a confidence to generalize as a problem of other type of solid waste in town such as institutional solid waste, industrial wastes and the like.

1.7 Organization of the Thesis

This study consists of five major chapters. The first chapter deals with introductory part which consists of background of the study, statement of the problem, research objective, significance of the study, limitation of the study and scope of the study. The second chapter contains review of related literatures including conceptual framework for analysis. Description of the study area, methods of sampling, data collection and analysis are included under chapter three. The fourth chapter deals with result and discussion that consists both statistical test and econometric estimation result. Conclusion and recommendation are presented in chapter five.

CHAPTER TWO

REVIEW OF RELATED LITRATURE

2.1 Theoretical Literatures

2.1.1 Definitions and Concepts

Solid waste

Waste is often found as a liquid or solid form. Solid waste is any type of wastes which is hard or not a water-like or liquid form; for example, used plastic bags, broken bags, leftover food or foods remains and the like (ILO, 2007). It is a by-product of human activities that tends to increase with the rate of urbanization, changing patterns of consumption and the improvement of living standards (ENPHO, 2008).

Rouse (2008) also noted that "Solid waste is defined as material which no longer has any value to its original owner, and which is discarded. The main constituents of solid waste in urban areas are organic waste (including kitchen waste and garden trimmings), paper, glass, metals and lastics. Ash, dust and street sweepings can also form a significant portion of the waste".

However, most of the people are not aware about their role in the production of solid wastes or about the impact of a day to day activity of human beings on the rate of waste production. Due to this, such people do not have a time to think about how follow the proper disposal methods of wastes generated in their home in order to make attractive the environment. In line with this issue, Prakriti (2007) also raised very interesting question, which is worthy enough to direct quote:

> *The sight of a dustbin overflowing and the stench rising from it are all too familiar sights and smells of a crowded city. You look away from it and hold your nose as you cross it. Have you ever thought that you also have a role to play in the creation of this stench? That you can also play a role in the lessening of this smell and making this waste bin look a little more attractive if you follow proper methods of disposal of the waste generated in the house?* **(prakriti, 2007:2)**

Hundred and thousand years ago, the solid waste management system was not a big deal in the globe. "The first humans did not worry much about waste management; rather they simply left their garbage where it dropped" (Net Industries, 2010). This implies that solid waste management task is becoming a serious concern due to the alarmingly increasing rate of population growth and the development of urbanization in the world. This is also supported by Prakriti's (2007) important project finding:

> *Since the beginning, humankind has been generating waste, be it the bones and other parts of animals they slaughter for their food or the wood they cut to make their carts. With the progress of civilization, the waste generated became of a more complex nature. At the end of the 19th century the industrial revolution saw the rise of the world of consumers. Not only did the air get more and more polluted but the earth itself became more polluted with the generation of non-biodegradable solid waste. The increase in population and urbanization was also largely responsible for the increase in solid waste* **(Prakriti, 2007: 2).**

Solid waste management

The human activities which take place in this world create waste. The wastes could be both solid and liquid types; and the way they are going to be handled, stored, and disposed can expose the environment and public health to risks (Zhu et al, 2008). SWM includes all activities that seek to minimize health, environmental and aesthetics impacts of solid waste.

> *Management of increasing amounts of solid waste has become a major challenge in many cities in developing countries. If solid waste is properly used, it can be a valuable resource, but if it is not effectively managed, it can result in serious adverse impacts on environment and public health. Solid waste management is therefore a critical component within urban sanitation and it is also one of the most important and resource intensive services provided by municipalities* (ENPHO, 2008: 1*).*

SWM is a management system of solid wastes which embrace all the activities ranging from generation to disposal. According to Rouse (2008), the basic concept of SWM involves the "collection, storage, transportation, processing, treatment, recycling, and final disposal of waste". He also noted that, the management system should be simple, affordable, sustainable –

economical efficient, environmentally sound and socially acceptable- , and providing the service for both the poor and wealthy households.

2.1.2 Types and Sources of Solid Wastes

Solid waste classified based on its origin, risk potential, or characteristics. Based on origin, solid waste can be classified in to food waste, rubbish, ashes and residues, agricultural waste, municipal service, industrial process waste, and demolition and construction wastes. With regards to characteristics, it also classify as biodegradable and non – biodegradable. In addition, based on its risk potential, again it can be categorized in to hazardous and non hazardous wastes (CED, 2003).

However, solid wastes are usually classified based on their sources (from which they emanate). Based on this bench mark, it can be categorized in to domestic or household, commercial, institutional, industrial, municipal services, construction and demolition, agricultural wastes. The explanation of each type of waste summarized as follows

Table 2.1: sources and types of solid wastes

Source	Typical waste generators	Types of solid wastes
Household	Single and multifamily Dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes

Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Institutional	Schools, hospitals, prisons, government centers	Same as commercial
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal Services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational area, sludge

Source: CED, 2003

2.1.3 Approaches to Household Solid Waste Management

There are alternative systems how the solid wastes, which are generated at household level, can be disposed without scarifying the quality of the environment and the safety of human health.

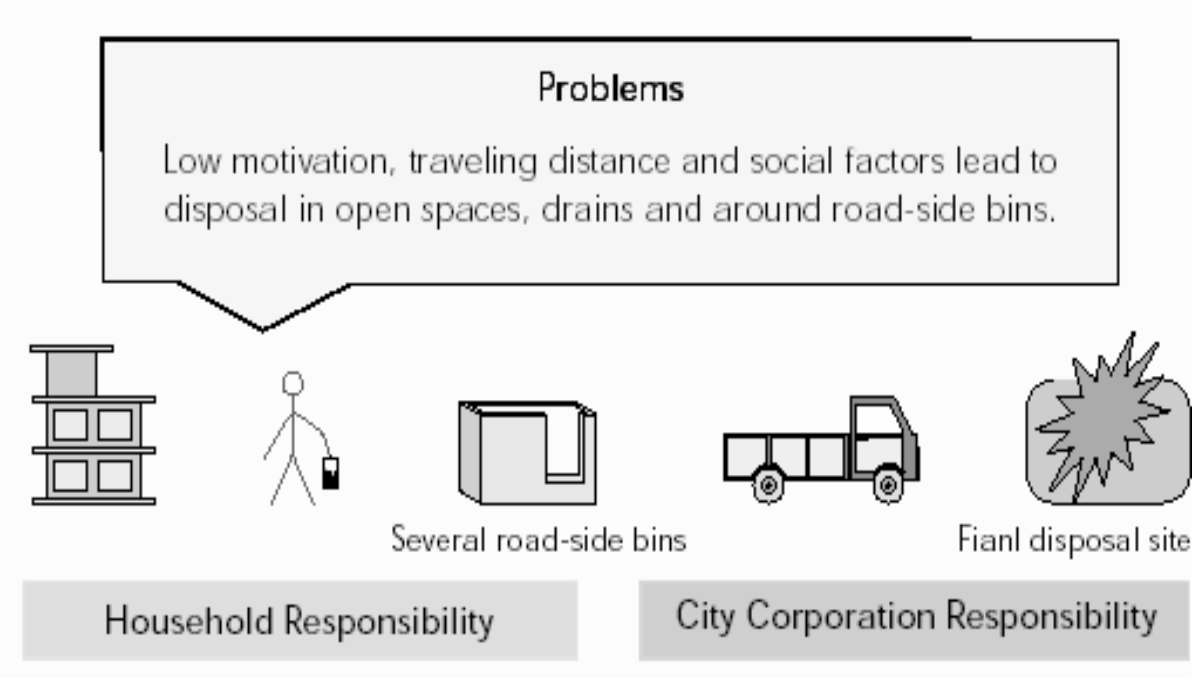
1. The conventional approach to solid waste management

Wastes generated in the home separate at sources based on their nature and stored until a small amount is accumulated. In this approach, the generator households are responsible to transport these stored wastes to the nearest dustbin or container, which is provided by the city municipality. Then, the municipality is responsible for the remaining activity of waste management, which transferring the collected wastes from the containers to the final disposal sites. Thus, the direct involvement of private waste collectors, as far as this approach is concerned, is rare (World Bank, 2000; Rahman, et al., 2005).

World Bank (2000) also stated that, problems in this system are often observed due to the failure of involved stakeholders, which are explain as follows: most of the time, the city administration fail to provide adequate number of containers or even the provided dustbin may not position in a convenient locations. Due to such reasons, the households may motivate to dispose their wastes on road, in sewerage, inside the villages or other illegal places. Moreover, poor motivation for appropriate disposal, lack of awareness or social factors are the other forces which make the environment unacceptable for certain members of households , who are interested to transport their wastes to the containers. On top of these, because of institutional and financial difficulties, the municipality may delay the collection and transfer of wastes to final disposal sites.

Rahman, et al. (2005) also noted that in conventional system of collection and disposal of wastes, the city municipality truck visit the transfer station point at a regular interval and collect and hauls the stored wastes to the final disposal place.

Figure2.1: Schematic diagram showing the conventional approach to solid waste management



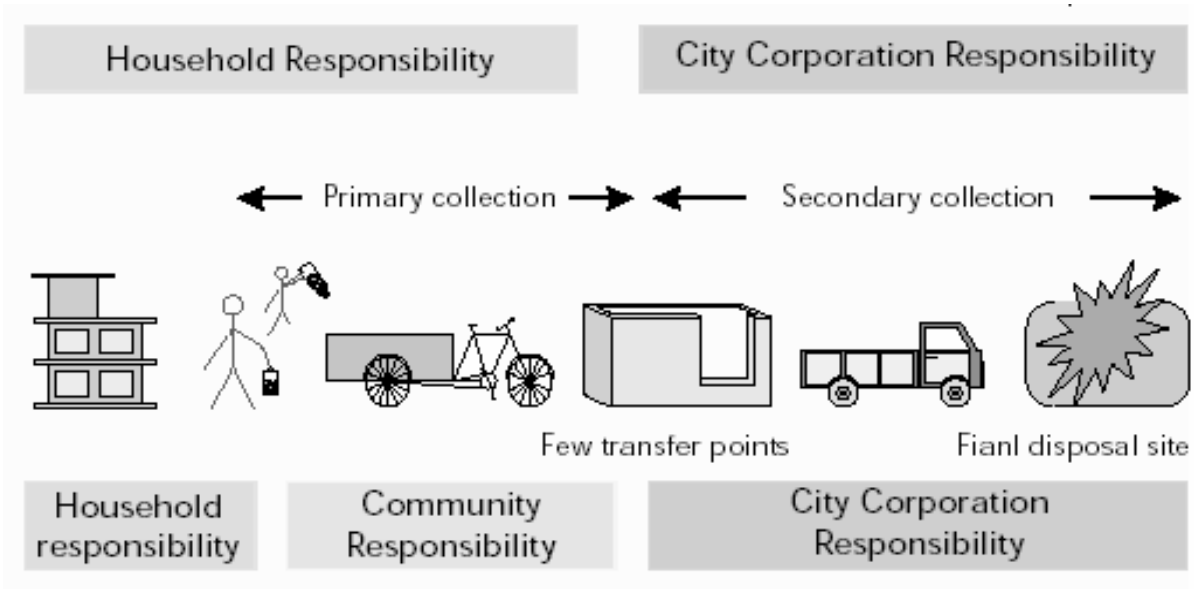
Source: adapted from Rahman, et al. (2005)

2. Community / participation based approach

This is the other option that explains the way how the stakeholders involved and discharging their responsibility. As stated above, in conventional approach there are various reasons which lead the approach to fail or the households to dispose their wastes inappropriately. Similarly this approach also has its own problems that can create difficulty while managing the solid wastes. However, in the community based approach, unlike conventional based approach, involves the primary collectors; it may be paid door to door collectors, community based organization (CBOs) or NGOs. Due to this reason, in this system, at least the difficulties which emanate from the institution financial point of view can be minimized.

The households are responsible to store their waste in plastic bags or other available materials by sorting in terms of their nature and hand over to the door to door / primary collectors. Whereas, the primary collectors are accountable to appropriately collecting solid wastes from the households and dispose on the town transfer station or secondary collection, given that the town municipality built the transfer station point nearest to the primary collection area. Moreover, the city municipality is responsible to collect and transfer wastes from secondary collection place to final disposal sites (World Bank, 2000; Rahman, at el., 2005). It implies that if each responsible stakeholders undertaken their responsibility as given, it is possible to say there is effective management in their side; for example, if the households are sorting their wastes and handing over to the assigned primary collector, regardless of the way how primary collectors and municipality are handling their responsibility, it is possible to say solid wastes management at household level is effective.

Figure2.2: Schematic diagram showing the community based approach to solid waste management



Source: adapted from Rahman, et al. (2005)

2.1.4 Problems and Challenges of Solid Waste Management

Since solid wastes are the product of human activities, it is almost normal come across some form of wastes from all types of human activities (Solomon, 2006). It implies that the production of waste is inevitable and its disposal is necessary. Hence, it is unthinkable to secure clean and healthy living conditions in cities and village without reliable and regular waste collection and disposal services.

He also noted that the dramatic increase in the quantities and compositions of solid wastes coupled with the rapid urbanization and population growth, which is the current feature of developing countries, need a serious establishment and development of an effective and economical solid waste management system. In other words, currently urbanization and population growth are alarmingly increases in developing countries coupled with the dramatic increase of solid waste generation rate. Therefore, since develop or establish an effective and economical waste management system is necessary, these less developed countries face various problems that prevent it from developing the needed system. Along with this view, Zurbrügg and Ahmed (1999) also stated that the collection and disposal of solid waste generated by the rapidly

expanding cities of developing countries is increasingly beyond the capacity and financial means of the city administration.

Generally, the problem and challenges of solid waste management can be categorized in to:

1. inadequate service coverage
2. Operational inefficiencies of services
3. Limited utilization of recycling activities
4. Inadequate management of non industrial hazardous waste and
5. Inadequate landfill disposal

In different literature, various scholars discussed about the above stated problems or challenges of solid waste management as the main problem areas of developing countries.

1. Inadequate service coverage

It refers to the insufficiency of municipal solid waste collection service in the given city. Zurbrugg (2003) stated that in the developing world the municipal solid waste collection services are delivered to only a limited part of the population. The populations who do not get the service of waste collection are low-income and live in pre-urban and slum areas. He also noted that the main reason for this limited collection services is lack of financial resources to cope with the increasing amount of generated wastes along with rapid growing cities. In other words, financial factor or constraint is the main cause for this inadequate service coverage of solid waste management activity.

It is the fact that in less developed countries both the government and generators do not have adequate finance or budget. Due to this, often inadequate fees charged on the generator and insufficient funds from a central municipal budget cannot be finance sufficient level of services. It is obvious that the main financial source of municipality is tax, which is not adequate to deliver effective solid waste collection service along with other responsibility of the municipality or city administration. But, even the government, particularly local government, gives higher priority to other way of city development while distributing annual budget from its available finance than solid waste management

> *Waste management services are generally a low-priority item in government budget allocations, thus the financial base for these activities is weak. This is true*

particularly of local governments who are the real overseers of solid waste management problems don't responded positively towards the need of waste management (Solomon, 2006:22).

Zurbrügg and Schertenleib (1998) also found that Because of lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities and insufficient funds from a central municipal budget cannot finance adequate levels of service; again municipal solid waste collection scheme of cities in the developing world generally serve only a limited part of the urban population.

2. Operational inefficiency

In addition to lack of financial resources, operational inefficiency affects the availability and sustainability of solid waste collection services.

According to Zurbrügg and Schertenleib (1998) the municipal sector in less developed countries often spend 20 to 50 percent of the total municipal expenditure for solid wastes related services. However, even at this level of expenditure the level of service is very low. They also noted that only 50 to 70 percent of solid waste is collected, which mean serving less than 50 percent of the population, and once collected, it is mostly disposed off inadequately in uncontrolled open dumps.

Operational inefficiency of municipal solid waste collection service can be due to inefficient institutional structure, inefficient organizational procedure or deficient management capacity of the institution as well as the usage of inappropriate technologies (Zurbrugg, 2003). It implies that like inadequate service coverage of SW happened because of financial problem; operational inefficiency operated by municipality happened due to institutional factors such as organizational structure, and technical skill of the human resources.

Adequate number of human resources, technical skill to operate the system and training are the crucial point for the success of solid waste management operations. However, with the reality of developing countries, many officers in charge of solid waste management, particularly at local level, have little or no technical background or training in management (Ogawa, 2005, as cited in Puopiel, 2010). In other words, since there little or no training for employees or no technical knowhow, the

operation of solid waste collection service is become inefficient. Besides, if the institution or municipality structure does not show the responsibility of the sector or other related procedures and there is lack of management capacity, operational inefficiency would be happened in solid waste collection services.

> *With regard to the technical system, often the "conventional" collection approach, as developed and used in the industrialized countries, is applied in developing countries. The used vehicles are sophisticated, expensive and difficult to operate and maintain, thereby often inadequate for the conditions in developing countries. After a short time of operation usually only a small part of the vehicle fleet remains in operation (Zurbrugg, 2003:2).*

Operational inefficiency of solid waste collection service can be solved or minimized either through training to employees of the institution or through involving private sectors in such solid waste management system. Along with this idea, Zurbrugg (2003) also stated that because of the failure of municipal system to provide adequate and efficient service, currently many developing countries have great interest in involving private sectors or companies in solid waste management. Besides, he also noted that arrangement with private sectors have not all been successful; rather the main factor for the success of private participant is the ability of clients (mostly municipal administration) to write and enforce an effective contract. Moreover, it is important to consider the other three key components of successful arrangement. They are: competition, transparency, and accountability on private sectors side.

3. Limited utilization of recycling activities

Informal sectors have traditionally playing an important role in recycling or recovering of inorganic materials from municipal solid wastes although such activities are seldom recognized, supported, or promoted by the municipality authority. However, the cost of separated materials, its purity, its quantity, and its location are some of the key factors that affect the potential of sectors to recover the resources. Besides, the cost of storage and transport are major factors that decide the economic potential for resource recovery. Although the sector has great recovery potential, reuse of organic waste material, often contributing to more than 50 percent of the total production of waste, is till limited. On the other hand, recycling or recovery of resource has great advantage such as reduces cost of the disposal facilities, prolonged the site life span, and reduce the environmental impact of disposal sites as the organics are largely blame for the polluting

leachate and methane problems. That is why solid waste managers in many parts of the world are now exploring manses to reduce the flow of biodegradable materials to landfills (Zurbrugg, 2003)

4. Inadequate management of non-industrial hazardous waste

It refers to the management potential of solid wastes that generated mostly by hospital, clinics, or other health institutions.

According to Zurbrügg and Schertenleib (1998) 85%, 10%, and 5% of the total solid wastes generated from hospital and clinics can be classified as regular domestic wastes, infectious and non-infectious but hazardous wastes respectively. Due to this, it is necessary to separate the generated wastes, as the non-infectious and non-hazardous wastes can be managed like ordinary household solid wastes.

In addition, hazardous and infectious solid wastes should be collected in different categories according to the way they should be processed at latter steps. However, even if most hospitals and clinics require separation of their waste and burning of their generated wastes, often their incinerators are usually out of order and these wastes enter the municipal waste stream. If this is so, it causes serious health problem to the public, especially to children, to scavengers, to collection crews and to workers at the landfills (Zurbrügg and Schertenleib, 1998).

5. Inadequate landfill disposal

The municipal solid wastes in less developed countries are often disposed off on land in a more or less uncontrolled manner. Such inadequate dumps make uneconomical use of the available free space; allow free access to waste pickers, animals and flies (Zurbrugg, 2003).

> *The environmental degradation caused by inadequate disposal of waste can be expressed by the contamination of surface and ground water through leachate, soil contamination through direct waste contact or leachate, air pollution by burning of wastes, and the spreading of diseases by different vectors like birds, insects and rodents (Zurbrügg and Schertenleib, 1998:6).*

According to Zurbrugg (2003), the main reasons for this inadequate disposal of waste, especially the situation where local governments are weak and underfinanced with rapid population growth, are financial and institutional constraints.

The other major reason for inadequate disposal is lack of appropriate guide lines that constitutes sitting, design and operation of new landfill including the missing of recommendation for possible upgrading options of available open dumps. Most of the time almost all of the municipal officials in developing countries think that uncontrolled waste disposal is the best; that is possible. Even the available guidelines are developed based on technological standards and practices that suited to the situation and regulations of high income countries. In other words, the available guidelines do not take in to consideration the different technical, economical, social, and institutional aspects of less developed countries (Zurbrügg and Schertenleib, 1998).

2.1.5 Key Solid Waste Management Strategic Issues

On the topics above the main problem areas of solid wastes management in developing countries with the cause or constraints that prevent effective waste management are discussed. Therefore, how to develop effective solid waste management system through avoiding the available constraints is the question of this topic.

According to USAID (2004), the key overriding issues that influence the situation in which solid waste collection is enhanced are the following:

I. private sector involvement

It is undeniable that most of the solid waste related activities are given to municipality or the town health institutions. However, as discussed above, because of one and other problems most of the duties are unable to fulfill to assure economically feasible, environmentally sound and sustainable ways of dealing with waste generation, collection treatment and disposal. If this is so, it leads to a serious problem of environmental pollution and human health too. Along with this view, Zhu, et al. (2008) also noted that "the failure of municipal solid waste management can result in serious health problem and environmental degradation". He also noted the reasons like the failure of municipality in solid waste management contributes a lot to flooding, breeding of insects, spreading of diseases, several environmental impact such as pollution of water resources

and air. Hence, since the municipality by itself cannot handle wastes effectively, the active participation of other stakeholders including private sectors and community based organization should be developed.

Private companies have been able to bringing the necessary finance and operating efficiencies that can help the municipalities to save money while achieving successful solid waste results. However, the experience of such approach is not that much in developing countries (USAID, 2004).

The private solid waste collector's service is best option for effective management, especially when the activity is beyond the capacity of the city administration or municipality. It is highly supported by:

> *Because of the poor performance of municipality the unsatisfactory situation created; this unsatisfactory situation makes it necessary for the municipal authorities to seriously consider new concepts and approaches for improving services. Private sector participation is an interesting option for boosting performance, whereby the municipal authorities change their role from service provider to regulator and service facilitator (Zhu, et al., 2008:73).*

Moreover, including the private sectors in solid waste management, which is generated from any sources, also allow the establishment of performance standards that the involved private sectors are required to follow. This performance standard is defined in the contract that they may sign for the work (USAID, 2004).

II. Public awareness, cooperation and participation

Public education or awareness of solid waste and its management is very crucial to improve management system. Public attitudes towards inappropriate disposal of solid wastes must be adjusted in order to avoid placing of additional burden on the collection program. While create awareness on generators sides, it is very important to give emphasis on selection of information that flow to the public. In other words, the information should give an assurance about whether the public (generators) are aware of the negative aspect of inappropriate solid waste management (USAID, 2004). This view also highly strengthened by:

Attitudes may be positively influenced through awareness-building campaigns and educational measures on the negative impacts of inadequate waste collection with regard to public health and environmental conditions, and the value of effective disposal. Such campaigns should also inform people of their responsibilities as waste generators and of their rights as citizens to waste management services (Schübeler, 1996:35).

Besides delivering required and related information to the public, it is also very crucial to recognized that solid waste management collection requires the participation of households, as generator, who involved in storage of the wastes in households, transferring wastes to communal containers, and the payment of the user fees. Due to this, the potential and interests of households to contribute to the service is very important (USAID, 2004).

This institution also noted that, the public awareness package also attempt to create a link between the actual cost of justifiable level of collection service and the generators willingness to pay. As per experiences, which have shown throughout the world, the generators are willing to pay more for improved level of service. However, in some places, fees have increased without realizing a significant improvement in service. If this so, it is became an obstacle to creating additional revenues required to enhance services.

Generally, there are various forms of community participation including:

- individual participation
- collective participation
- material or financial contributions and
- Active participation in formulating projects. According to USAID (2004), each of the above forms of participation should be parts of the city's solid waste management program.

III. cost recovery and financial resources

It refers to the degree of possibility to have a clear link between the actual cost of solid waste collection service and the revenue that generators must pay for them. In other words, revenue driven for solid waste management services would be equal to the overall costs of the package. Besides, residential generators must be educated to the fact that there are different components to the solid waste management services that they receive.

2.1.6 Effects of Solid Waste

It is the fact that, if solid wastes are not managed properly there are many negative impacts on aesthetic, human health and ecology (water and air pollution). Therefore, In order to control the management activity in a good manner and have a proactive measure for such negative impact, one must have a good understanding about the effects and risks that may arise from improperly managed solid wastes.

According to Melaku (2008), the following are some of the most important effects because of uncontrolled solid waste disposal systems.

- Uncollected wastes cause blockage of drains, which result in flooding and unsanitary conditions.
- Flies and Mosquitoes breed in some constituents of solid wastes, and flies are very effective vectors that spread disease.
- Waste dumps are good shelter for rats. Rats consume and spoil food, spread disease, damage electrical cables and other materials.
- Uncollected wastes degrade the urban environment, discouraging efforts to keep the streets and open places in a clean and attractive conditions.
- Dangerous items (such as broken glass, razor blades, needles and other healthcare wastes, aerosol cans and potentially explosive containers) may pose risks of injury or poisoning, particularly to children and people, who sort through waste.
- Waste items that are recycled without being cleaned effectively or sterilized can transmit infection to later users.
- Polluted water (leachate) flowing from waste dumps and disposal sites can caus serious pollution of water supplies.
- Waste that is treated or disposed of in unsatisfactory ways can cause a severe aesthetic nuisance in terms of smell and appearance.
- Fires on disposal sites can cause major air pollution, causing illness and reducing visibility, making disposal sites dangerously unstable, causing explosions of cans, and possibly spreading to adjacent property.

2.2 Empirical Literatures

Longe et al (2009) made their study on the title of people's perception on household solid waste management in OJO local government area in Nigeria. They applied both quantitative and qualitative methods, particularly statistical tools with severity index, in order to analyses the survey data gathered from randomly selected 60 respondents. The research objectives were assessing the existing household solid waste management practices and public perception on the effectiveness of the current system. Beside the assessment of effect of demographic factors on people perception, they were develop three means in order to assess or evaluate the public perception on solid waste management in the study a(i.e. public opinion and perception on SWM service, willingness to pay for SWM service, and level of patronage of available SWM service).

This research finding shows that demographic factors have a significant impact on the people's perception towards solid waste management service in the study area. They found that gender difference (being male or female) have a significance impact on perception. In addition, educational levels and income of the respondents have a significance positive relationship, whereas, age of the respondent have a negative relation with perception of the people on solid waste collection services. Regarding to willingness to pay, even though the result show a positive relationship between willingness to pay and people perception, till the people are ready to pay for collection service if it delivered regularly. However, in the study area there is lack of accessing the private waste collectors' service. Therefore, the local authority should give attention to performance monitoring and control of the services of private sectors in order to enhance and sustain good service delivery.

All in all, they found that inadequate service coverage and lack of timely household waste collection are the main problems in this particular area. To develop effective solid waste management system and to sustain the private sector participation in solid waste management activity through avoiding the above mentioned problems, they suggested the following: Modern waste management methods that place emphasis on waste reduction, recycling and re-use should be encouraged in the local government area and in the entire State with legislative backing, increase awareness and re-education household waste minimization and sorting before collection should be encouraged, the responsible bodies should introduce training and re-training and re-orientation program for the private sectors and the waste generators respectively on issues of waste management techniques as a matter of urgency in order to enhance the overall success of the current SWM system.

Puopiel (2010) studied on solid waste management in Ghana: the case of tamale metropolitan area. His research objective was to examine the factors of effective solid waste management in the metropolis and suggest possible measures to tackle the problem. He gathered the necessary data from 156 randomly selected samples and analyzed through descriptive statistics such as table, percentage and pie-chart.

Finally he found that inadequate skip supply for storing wastes, lack of routine collection of wastes, poor methods of waste management, and inadequate resources for waste management institutions to effectively collect the waste generated are the main factors that affect the effectiveness of solid waste management in the area. In other words, he found more of institutional factors. To effectively tackle the problems enumerated, some measures are recommended by the researcher. These are: Provision of adequate skips and dustbins, regular collection of Waste, use of Integrated Solid Waste Management Model, proper Management of Landfill, and adequate resources of Waste Management Institutions.

Kamara (2006) carried out study on household participation in domestic waste disposal and recycling in the Tshwane Metropolitan Area: An environmental education perspective. The objective of this research was to investigate the relevant factors affecting household participation in domestic waste disposal and recycling in Tshwane Metropolitan Area. The researcher collected data from 46 randomly selected households through standard household survey questionnaire and analyzed through quantitative way of analysis, particularly used descriptive statistics. As hypotheses, the research stated socio economic factors (educational level and income or wealth) and institutional factors can be the main factors of household participation.

Finally, as expected, the conclusion confirmed that, the main factors of household participation on domestic solid waste management are socio-economic factors (income and educational level) and institutional factors. It had shown that the wealthier people in the study area participating in domestic solid waste management than the poor one. In addition, the people's participation on household solid waste management and their educational level have a positive relationship. Moreover, this study found two other major factors that are related to institutional factors: low level of awareness on environmental implication of proper waste management and low level of household coverage with the provision of waste management facilities. Therefore, it suggested that there is a need to increase the outreach of awareness creation on household sides,

particularly the positive implication of proper solid waste management and the institution, again, should provide adequate facilities for proper waste management.

Zahur (2007) made study on solid waste management of Dhaka city: public private community partnership. He assessed the solid waste management system in order to show the effect of private sector and community based organization involvements for the improvement of waste collection system in the area. As the data shows, although municipal officials recognized the importance of adequate solid waste collection and disposal as well as resource recovery and recycling, it is mostly beyond their resource to deal effectively with the growing amount of solid waste generated by the expanding cities. Consequently solid waste is indiscriminate by dumped on roads and in open drains thus leading to serious health risk and degradation of living environment for millions of urban people. Through time, however, the importance of community and private sectors involvement in solid waste management and use of adapted technologies were recognized for improving the solid waste management system. It implies that access to door to door solid waste management, either self-organized private sectors or NGOs or CBOs, is very crucial for the improvement of household solid waste management.

Jenkins, et al (2000) carried out study on The Determinants of Household Recycling: A Material Specific Analysis of Recycling Program Features and Unit Pricing. Ordered probit econometrics model was used to analyze data of set of socio-economic variables including recycling program policy variables and unit pricing program policy variables as explanatory variables in order to investigate the main determining factors for recycling of solid wastes at household level.

In this study drop-off and curbside from recycling program policy variables and household's income, family size, household head age and its educational level from socio-economic variables were found to be the main determinants of household solid waste recycling practice.

He further found that like household income and education, household size also has a positive and significant relation with the intensity of recycling of household solid wastes. Its justification was when the family members are increasing it would contribute to the number of occupants. Due to this, the increasing number of occupant in a specific area, the intensity of recycling activity in the area would be increases.

Poswa (2004) conducted a study on the importance of gender in waste management planning: a challenge for solid waste managers. He used simple descriptive statistics to analyze the data obtained from randomly selected 400 sample households. The ultimate goal of the research was to contribute some issues for the improvement of solid waste management services to the residents in developing communities. Therefore, to achieve this overall aim the researcher derived one objective: to assess the effect of socio-economic factors (in particular gender) in the planning and operation of a solid waste management system.

Finally, this study found that women in most homes in the middle and low socio-economic status suburbs in the study area were more active in the enquiry. It was justified as indicating their active role in family affairs including waste handling in their respective homes.

Moreover, the study concluded that, there were great differences between men and women on the choice of type of waste collection service system. Women most of the time preferred a door-to-door waste collection system unlike men whose choice was a drop off centre. Such variation or differences can be attributed to the cultural traditions, which govern gender relations in the households. He also said that, like the finding of World Bank, 2009, women in most societies are responsible for the domestic works, which include many tasks including childcare, shopping, cooking, cleaning and wellbeing of their husbands.

Bizatu and Negga (2010) conducted a study on community based assessment on household management of waste and hygiene practices in kersa woreda, Eastern Ethiopia. In this study the researchers' objective was to assess the status of waste management and hygiene practices in Kersa Woreda, Easteren Ethiopia. Therefore, in order to achieve this main objective, the researchers collected data from randomly selected 444 sample households through survey questionnaire and then analyzed the data via SPSS version 16 including statistical tests at 95% confidence interval.

From the study they found that majority of the households (66%) disposed off their solid wastes in open dumps and 6.9% of the households had temporary storage for solid wastes. With regard to sex and solid waste management, the study indicated that, about 98.4% of the selected households revealed that the responsibility of waste management is left for women and girls. In

addition, the waste management status in the study area was highly related with the educational level of the households.

Generally, the study concluded that household management of waste is in poor condition. Health-workers and local authorities must pay special emphasis to improve these conditions.

Tewodros (2006) carried out study on household behavior and solid waste management: survey evidence from mekelle. The objective of this thesis was to explore the structure and performance of household waste management practices such as source reduction & separation and final disposal by investigating the relationship with economic, demographic and environmental behavior of households. Besides, it conducted for the purpose of investigating the supply side of waste infrastructure facilities in relation to household solid waste collection, disposal and recycling. He used both multinomial logit and probit estimation econometric models in order to identify and describe the main determinants of household's choice on dump sites. The researcher collected the necessary primary data from randomly selected 200 sample households.

The study estimated that demographic factors and institutional factors have a significance impact on the household choice of disposal sites.

Finally he found that demographic factors such as age, sex, educational level, family size, number of females in the household, who are below 15 years old and years of stay in the city do not have a significant effect on the site selection of the households to dispose their wastes, Whereas, institutional facilities like distance of containers from people' house and inadequacy of waste storage containers in the city have a significant contribution for households to dispose their wastes in unauthorized place. Due to this, the researcher concluded that, institutional factors are serious causes for the action of households in the case of dispose wastes in illegal places or sites. On the other hand, the educational level and other demographic factors are not. It mean that, the number of years that the household head stay in the class does not matter; rather the awareness of households about solid waste positive and negative impact through environmental education or changing the household awareness about waste and its management have a strong improvement on disposal system.

Gebrie Kassa (2009) study on Management of Domestic Solid Waste in Ethiopia: Operational Analysis and Assessment of Constraints in Bahir Dar Town, the Capital of Amhara National Regional State, Ethiopia. The main objective of the research was examining the operational processes and associated institutional, financial, and socio-cultural constraints.

The study result indicated that inefficient organizational structure, scarce and frequent turnover of workers, unequal distribution and improper assignment of facilities, lack of financial & legal instruments, poor handling of waste by the community are the major factors that influences solid waste management. Besides, demographic factors also have a significance impact on the effective management of household solid wastes.

G/tsadkan (2002) made a study on Domestic Solid Waste Management in Mekelle City: Tigray Region. His objective was to examine the overall pattern of solid waste generation, collection and disposed and also the extent of household participation on the management of solid wastes in Mekelle city by analyzing primary (which are collected from the selected 300 households) as well as secondary data. In this study, the researcher was applied descriptive and inferential statistics and map at the time of data analysis.

Finally, findings of this study show that the management practice of wastes in this particular city was very poor. Hence, the study goes further and found out the main causes for this poor performance of the city's solid waste management. Then, it indicated the finding as follows: the main causes for the poor performance solid waste management in the study area include improper organizational structure, shortage and dissatisfaction of the workers, inadequacy and improperness of the collection and transportation facilities (both the containers and vehicles), unfair distribution and sitting (placement) of the containers, and inadequate financial resources.

Moreover, there were no detailed solid waste management related regulations and public education. The solid waste collecting, transporting and disposal techniques used were also part of the main constraints of the solid waste management in the city of Mekelle.

The findings also indicated that certain social-cultural factors have worsened the problem of solid waste management in Mekelle. The leading constraints in this aspect include inappropriate

handling of solid wastes at home, improper dumping of wastes in the container and the illegal disposal of solid waste everywhere in city.

Solomon (2006) conducted a study on solid waste management: a case study of household solid waste management in arada sub-city, Addis Ababa, Ethiopia. The objective of this study was assessing the performance of household solid waste management in the sub-city. The researcher was applied qualitative description to interpret and present the data that obtained from randomly selected 400 sample households.

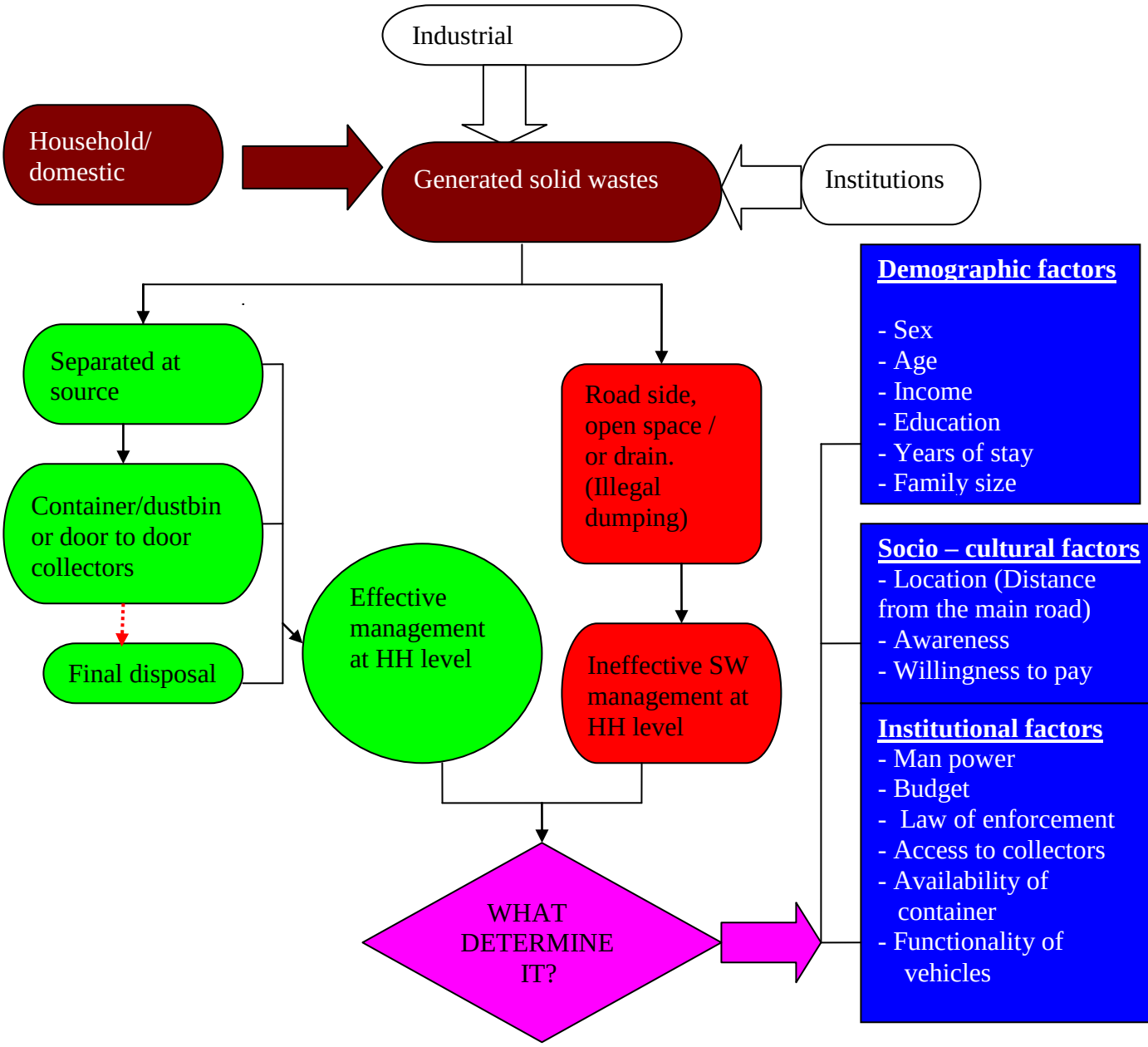
Finally, he found that even though household solid-waste service is given to the population in the sub-city, the service is considered poor by the population due to institutional, socio - cultural and financial factors such as lack of adequate facilities for solid waste collection and disposal services, displeasure of the workers with incentives, unfair placement and improper use of waste containers, inadequate assignment of budget to the sector, illegal ways of disposing wastes, and insignificant participation of the community in waste management.

Conceptual Framework for Analysis

Based on the above review of related literature (both theoretical and empirical literatures) the researcher has developed the following conceptual framework for the purpose of analysis. As stated above, solid wastes are generated from different sources such as from industries, institutions, commercials, households and the like. However, this particular study was emphasized on solid wastes, which are generated from the households. That is why the researcher tried to make colorful the flow of waste management that generate from households. In addition, since the thesis is conducted on solid waste management at household level, it did not analysis the current situation and problems of final disposal site of the town; rather the study circulated on the responsibility of households. Due to this, the researcher putted a dotted line between final disposal and dust bin / containers (see figure 2.1 below). This is because beyond the scope of households' responsibility.

All in all, the main focus and scope or boundary of this study is summarized on the following conceptual framework.

Figure 2.3 Conceptual Frameworks for Analysis



Source: developed by the researcher, 2011

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1 Description of the Study Area

3.1.1 Physical Characteristics of Ambo Town

Location of the Town

The geographical (astronomical) location of ambo town is approximately between8^0 56'30'' N - 80 59'30'' N latitude and between 37^0 47'30'' E – 37^0 55'15" E longitude. Relatively Ambo town is located 114 kms far away West of Addis Ababa, 60 kms North West of Weliso town and 12kms east of Guder town (Ambo municipality office, 2010)

Administrative Status

Ambo town is a zonal town with the 2^{nd} grade (stage) of administrative status. The distance of Ambo town from the capital city Addis Ababa is approximately 114 kms from the centre of the town. The town has three former urban Kebelles such as kebele 01, kebele 02 and Keblle 03. In addition to these three urban kebeles, now the town is expanded outwardly and included certain farmers kebele associations such as awwaaroo and iiiaammuu muujjaa in the eastern direction, sanqallee farisiiii in western, goosuu qooraa in the southern and oddoo liiban kisoosee in the northern direction *(Ambo municipality office, 2010).*

3.1.2 Demographic Characteristics and Urban Social Services

Introduction

Demographic analysis is concerned with the size, composition, and distribution of populations; their patterns of change over time through births, deaths, ad migration; and the determinates and consequences of such changes' population studies yield knowledge important for planning, particularly by governments, in fields such as health, education, housing, social security, employment, and environmental preservation. Such studies also provide information needed to

formulate government population policies, which seek to modify demographic trends in order to achieve economic and social objectives.

Population Size

The population and housing census conducted in 1994 and 2007 by central statistical authority are considered here to see the trend of the population size of the town under study. Ambo town is the capital town of west Showa zone with population size of more than 67,544 including the population of expansion areas in 2009. According to 1994 and 2007 population and housing census of CSA the total population of the town was 27,636 and 50,267 respectively. The latter figure is typically that of the proper town, which is including the figure of the expansion areas. The number of households in 1994 was 6,121 and in 2009 it becomes 15,223 (Ambo municipality office, 2010)

Sex Composition

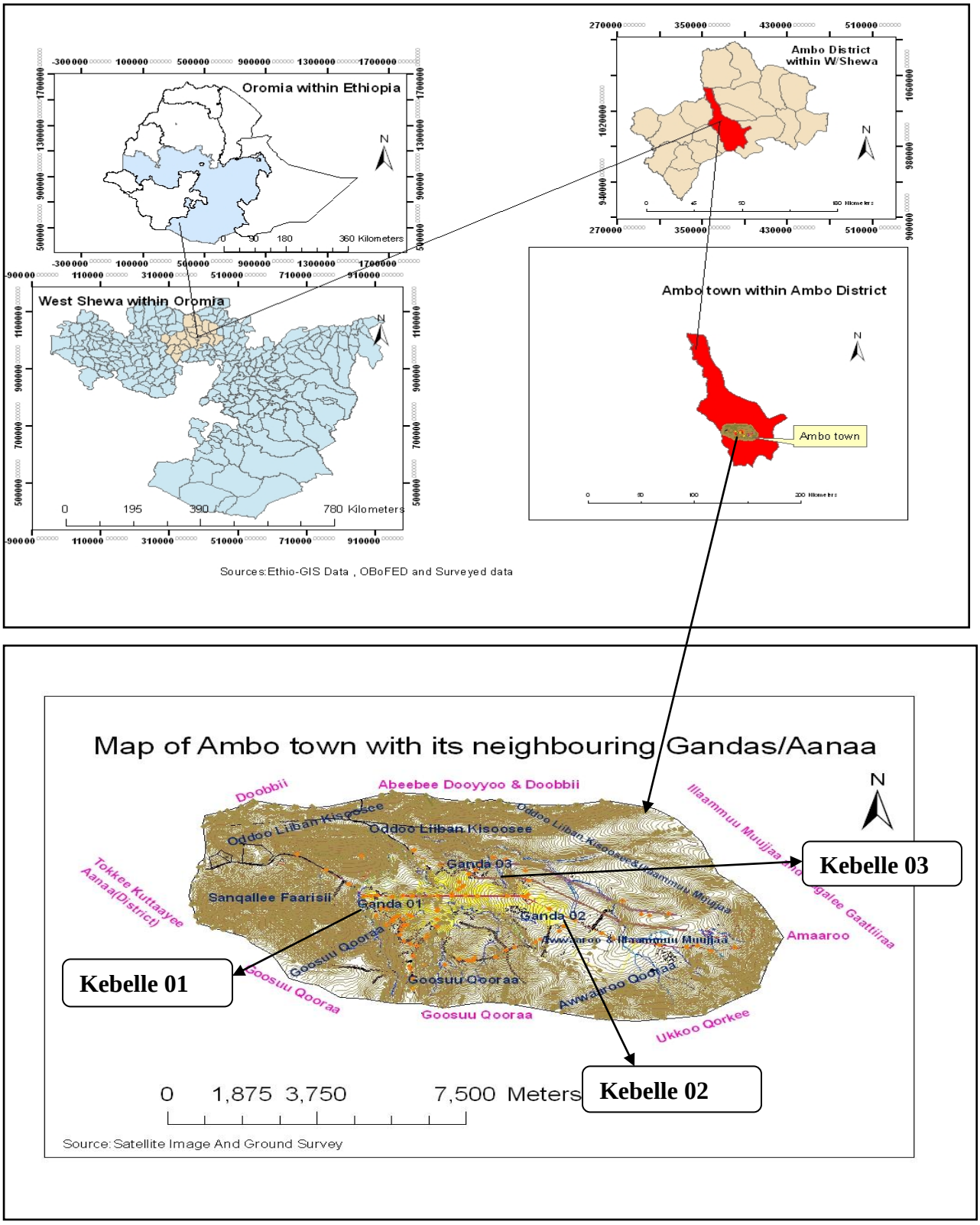
Sex is one of the basic characteristics of population. Sex composition is very important for any analysis, as data on sex provides useful information about reproductive potential, human resource, level of school attendance by each sex, and so on. Male population is slightly higher (50.l8%) than female population (49.2%) at the town level.

Age Composition

Age is one of the basic demographic characteristics of a population. Age data are useful for demographic analysis and for various types of socio economic development planning. The population distribution of Ambo town by age group and sex in 2009 indicated that out of the total population, about 37.3% of its population is under years of age, 59% in the intermediate age group (15-64) and 3.7%above 64 years of age population, about 37.3% of its population is under 15 years of age, 59% in the intermediate age group (15-64) and 3.7% above 64 years of age.

These data indicate that a significant proportion of the population was within the age group 15-64 implying a ginger intermediate age group. The young dependency ratio for the town was estimated to be 63.2% meaning, of 100 persons in the working age group (15-64) had to support on the average over 63 persons whose age is between 0-14 and also, the old dependency ratio for the town was estimated to be 6.3% average 6 persons whose age is 65 and above.

Map 3.1: Map of the study area



Source: Ambo municipal office, 2011

3.2 Data Type and Sources

This study is an explanatory type of study; since it explains the relationship between effective solid waste management at household level and the various explanatory variables. To achieve the pre - stated objective of the thesis, both primary and secondary data were used. Moreover, the researcher also used both quantitative and qualitative data. Quantitative data were obtained from the households via questionnaire, which was designed by the author with the support and supervision of advisors and the qualitative data were taken from the private solid waste collectors through focus group discussion and solid waste management sector staff through semi – structured interview in order to triangulate the analysis.

Primary type of data were gathered from households, municipality – particularly from solid waste management sector staff, and from the private enterprises who are currently delivering waste collection service to the society via self- administered questionnaire, semi – structured interview and focus group discussion respectively. In addition, in order to collect the required secondary data, documents such as journal articles, the institution (municipality) document, and other relevant internet resources were reviewed.

3.3 Target Population

Ambo town had six independent 'kebeles' until the year 2009, August. But right from the year 2009, September, due to the adjustment of the town structure in general, Ambo has only three independent 'kebeles'. The population that included under the study area were the whole members of the town, which are permanent residents and legally registered on their 'kebele' administrative units. Moreover, the whole members of private waste collectors and solid waste management experts were included in focus group discussion and interviews respectively.

3.4 Sample Size and Sampling Procedures

3.4.1 Sample Size

Sample size determination was undertaken through statistical technique, which is developed by (Cochran, 1977; as cited by Lemma, 2007). According to the formula the sample size is determined with some degree of precision for general population was used.

$$n = \frac{NZ^2PQ}{d^2(N-1) + Z^2PQ}$$

Where:-

n = sample size of housing units

P= Housing unit variable (residential houses)

Q= Non-residential houses (offices, schools, etc in terms of %age) = 1-P

N= Total number of housing units

Z= Standardized normal variable and its value that corresponds to 95 % confidence interval equals 1.96

d = Allowable error (0.05)

According to obtained data from the municipality of the town (2010), there are about 8,185 housing units (N): from these about 85% (P) are of residential and the rest 15% (Q) are of non-residential.

Thus,
$$n = \frac{NZ^2PQ}{d^2(N-1) + Z^2PQ} = \frac{8{,}185\,(1.96)^2 \times (0.85)(0.15)}{(0.05)^2(8{,}185) + (1.96)^2(0.85)(0.15)} = 191.34$$

Therefore, n = 191.34 is the minimum sample size of housing units for reliable results. To be safe in case of unobservable problem during data collection, non – cooperativeness of households and other causes the sample size was increased to 200 respondents (households). Therefore, the results of 200 households were analyzed, which is sufficient enough according to the sample size calculated above.

3.4.2 Sampling Technique and Procedure

The researcher used multi stage sampling technique in order to select sample households. In the first stage, cluster sampling technique was used and classified the town in to three strata based on its 'kebelle[1]' administration. In the second stage, as far as Ambo town is concerned, each 'kebelle' has its own sub-sections or 'Gots[2]' (i.e. kebelle 01 has 18 'Gots', kebelle 02 has 10 'Gots' and kebelle 03 has 11 'Gots'). Therefore, simple random sampling technique, particularly lottery system, was used to select 'Gots' from each kebelle. Based on this, 8, 4 and 4 'Gots' from

[1] It refers to an administration units under sub-city or woreda , which is depending on the structure of the town
[2] It refers to a small administrative unit, which is structured under kebelle administration units

kebelle 01, 02 and 03 were taken, respectively. To do this, the list of each kebelle's 'Gots' were used as sample frame. The number of households drawn from each 'Got' were determined based on the size of the 'Got'. Finally, since the 'kebelle' administrations did not have organized documents for house number of each household, the researcher forced to use non-probability sampling. Therefore, convenience non –probability sampling technique was applied to select the direct participant households from each 'Got'. The respondent unit was the head of the house.

Table 3.1: Total households that are selected as a sample

Kebelle	SELECTED GOTS	NUMBER OF HOUSEHOLDS	SELECTED SAMPLES
Kebelle – 01	Got – 2	132	10
	Got – 4	139	11
	Got – 7	226	18
	Got – 10	140	11
	Got – 11	58	5
	Got – 13	77	6
	Got – 16	95	7
	Got – 18	164	13
Kebelle - 02	Got – 1	263	20
	Got – 2	164	13
	Got – 8	161	13
	Got – 10	267	22
Kebelle – 03	Got – 2	183	14
	Got – 4	154	12
	Got – 7	205	16
	Got – 11	113	9
TOTLA	16	2541	200

Source: survey result 2011

3.5 Data Collection Techniques and Instruments

In this study, the unit of analysis was made at household level; whereas, the unit of data collection was the head of each household. The data were gathered from 200 households, the solid waste management staff of the town municipality and the private waste collectors through different tools. Self administered questionnaire, semi – structured interview and focus group discussion were used as tools in order to collect primary data. Moreover, document review was made for secondary data.

Questionnaire was designed by the author with the support and supervision of advisors. The draft questionnaire was pre-tested on 15 randomly selected households. In this phase all four data collectors and the researcher himself have participated. Thus, on the base of pre-test corrections were made on the actual questionnaire. The household survey questionnaire used in this particular study to collect data in line with: the existing solid waste management practice at household level, attitude towards solid wastes and collection service, the economic activities and educational background, the delivery of solid waste collection service given by the private participant, and prevention factors of effective solid waste management. The researcher also designed semi-structured interview in order to collect relevant data, which were impossible to obtain from the household through questionnaire, from the responsible staff for the purpose of triangulation.

More specifically, to achieve the first two objectives, the required data were collected from the selected households through well designed and pre tested questionnaire and from the municipally officials via semi – structured interview methods. Since the last objective is related to the responsibility and performance of door to door waste collectors, the necessary data for this objective were gathered directly from the involved enterprise members through focus group discussion.

In addition, data from secondary sources were gathered from the municipally solid waste related document, the town structural plan document, books, periodicals and different valuable websites. To make data collection more easier and faster, four enumerators were recruited who can easily communicate with the respondents in local language. The enumerators were given training on how to approach the respondents and how to collect accurate and valid data before the actual data collection was began.

3.6 Methods of Data processing and Analysis

3.6.1. Data processing

This part is very important to conduct a research by keeping its reliability and validity. In this section the researcher performed the data editing, coding, data entry and data cleaning activity in

order to check the consistency of the data which were collected from the respondents by various tools.

3.6.2. Data Analysis

In this section the researcher employed both of qualitative and quantitative methods of analysis. The qualitative method of analysis was applied for the data that were collected via interview and focus group discussion. Quantitative way of analysis was also applied for the data which were collected from households through structured questionnaire. The data were analyzed by using SATA 10; computer software. The researcher used simple descriptive statistics, inferential statistics, and econometric model analysis to interpret the result.

To achieve the first objective, simple descriptive statistics like: frequency, percentage, mean, standard deviation as a central tendency and measure of dispersion were used to describe the existing situation of solid waste management at household level of the study area through tabulation, pi- chart, bar graph. Since descriptive statistics does not help to infer/predict something for the future; rather it help to simply describing the current activity of the waste disposal, the researcher was applied t-test – for continues data and chi-square – for discrete data - in order to test the relationship between variables.

Econometrics model

To explain the observed variation in disposal practice, logistic regression model in which the dependent variable effective solid waste management is regressed as a function of the explanatory variables demographic, social – cultural, and institutional factors were used. The households' response whether disposed off wastes legally or illegally was outlined as a binary–choice model.

As outlined in Gujarati (1995) and Green (2003), logit or probit models are widely applied to analysis for a limited dependent variable which has a binary outcome. Despite this, Green (2003); as cited in Antigen (2010) argues that although both models result with similar outputs, the logit model is easier in estimation. Thus, binary logit model was employed in this study. To analyze the factors that determine the effectiveness of solid waste management at household

level, households were classified in to two categories as the one who manage solid wastes effectively and ineffectively.

Model Specification

Logit model

Following the concept of the model from Green (2003) and Gujarati (1995), the logit model for solid waste disposal practice at household level determinants can be specified as below:

(1) $$P(Y_i = 1) = \frac{1}{1 + e^{-(\beta_i X_i)}}$$

(2) $$P(Y_i = 1) = \frac{1}{1 + e^{-Z_i}}$$

Where: P (Yi=1) is the probability that a household dispose their wastes legally, Zi= the function of a vector of explanatory variables), e- represents the base of natural logarithms and equation (2) is the cumulative distribution function. If P (Yi=1) is the probability of choosing to dispose legally, then 1- P (Yi=1) represents the probability that the household choose to dispose illegally and is expressed as:

(3) $$1 - P(Y_i = 1) = 1 - \frac{1}{1 + e^{-Z_i}} = \frac{1}{1 + e^{Z_i}}$$

(4) $$\frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i}$$

Equation (4) simply is the odds ratio, the ratio of the probability that a household will be disposed legally to the probability that it will be disposed illegally. Taking the natural log of equation (4), we obtain

(5) $$L_i = \ln\left(\frac{p(Y_i = 1)}{1 - P(Y = 1_i)}\right) = Z_i$$

Where: Li is the log of the odd ratio which is not only linear in the explanatory variables but in the parameters also. Thus, introducing the stochastic error term (u_i), the logit model can be written as

(6) $$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + - - - + B_n X_i + u_i$$

Where X's = are explanatory variables that determines the household level solid waste disposal system,

βo is the constant term and β's are coefficients to be estimated.

OPERATIONAL DEFINITION of VARIABLES

Dependent Variable

Effectiveness: the effective solid waste management at household level can be defined in various forms by different scholars. According to **Memon (2002),** effective solid waste management at household level mean the households store their wastes on plastic bag or other material and then either hand over to the door to door waste collectors or dumping on the container depends on the system of the given city. Otherwise if the household dispose their waste inside the road, on sewerage or burning on their back yard, it is ineffective management in the household side. He also stated that managing solid wastes effectively by the household means legally disposing their wastes on the given place; otherwise illegal. Along with this view, the municipality of this research area informed its households to collect their waste and give to the door to door private collectors. If this so, the householders managing their wastes effectively (legally); otherwise it is illegal. Therefore, the operational definition of effective solid waste management in this particular study is that the households hand over their collected waste to private collectors (i.e. legally) otherwise, it will be illegal /ineffective/.

Due to this, for the purpose of regression, it was coded as 1 if the households dispose their waste legally and 0 if the households dispose their waste illegally.

Independent variables

A range of demographic, socio – cultural and institutional variables that are expected to influence or else determine the household solid waste disposal practice described and hypothesized below as explanatory variables;

1. **Age:** is a continuous variable expected to negatively influence the solid waste management practice at household level. Mostly observed that old aged people do not focus on the environment related issues and the impact of waste on their health; they also consider as this is the responsibility of the government in general, municipality in particular. But the youths are aware on the solid waste management and give a certain emphasis as better as the previously stated aged people.

2. **Sex:** This is a dummy variable, which takes 1 if sex of respondent is female, 0 otherwise. As traditional trend shows often the women are feeling as responsible to clean their houses and highly committed to such tasks. So, it is expected that women could effectively manage the solid wastes at household level than men.
3. **Income:** it is a continuous variable expected to positively affect the household solid waste disposal practice. It is expected that the higher the income, the higher the interest to improve the management system of their wastes.
4. **Years of stay:** it is a continuous variable which is expected to have a positive influence on the management practice at household level. When the number of years that the people stay/ live in a specific area is increasing, the feeling of responsibility to properly dispose solid wastes and cleaning the environment in general would be develop.
5. **Family size:** it is a continuous variable expected to negatively influence the management practice of household solid wastes. As the number of household members increase the waste generated at household level would be higher and may initiate to dispose that much amount of wastes illegally – the place where they could easily access without considering the appropriateness of the disposal site and their practice.

6. **Education:** it was measured as the number of year staying in school. It is expected to have a positive impact on the disposal practice of the given household.
7. **Location (Distance from the main road):** it was regressed by using the distance between their home and the town main road, in terms of meter. It is hypothesized that, when the household's village is far away from the main road, they might be motivated to dispose their wastes illegally.
8. **Willingness to pay:** it is a dummy variable, which takes 1 if the households willing to pay for the service rendered by the solid waste collectors; 0 otherwise. It is expected to positively affect the residential disposal practice. As specified by scholars if the households are not willing to pay for the given collection service, they preferred to dump their wastes on the illegal alternative sites other than the legal system.
9. **Awareness:** It is a dummy variable expected to positively affect the disposal practice of the given households. It was coded as 1 if the respondent receipt orientation or information from the municipally about how they are going to collect and dispose their waste in particular and the consequence of inappropriate management of wastes on the environment and their health in general; 0 otherwise.
10. **Access to collectors:** it is a dummy variable, which take 0 if the access of households to get the service of waste collector is none at all; 1 if not enough access; 2 if there is enough access. The householders may collect their wastes properly. However, if they do not have an access to get the service of door to door collector, they may be forced to dispose somewhere illegally. Therefore, it is expected to have a positive impact on the effective practice of solid waste disposal at household level.

Table3.2: Summary of explanatory variables and hypotheses

Variables	**Specification**	**Category of variables**	**Expected Effect on the Effectiveness of HHSWM**
Household head age	Years	Continuous	-
Household head sex	1 if household head sex is female 0 if household head sex is male	Categorical	+
Household head educational level	The number of years staying in the class	Categorical	+
Location (Distance from residents to the main road)	The distance of residents from the main road of the town in meter	Continuous	-
Year of stay	Number of years staying in the town	Categorical	+
Family size	Number of people living together	Continuous	-
Income	Households monthly income	Continuous	+
Willingness to pay	1 if they are willing to pay 0 if not	Categorical	+
Awareness	1 if they have orientation about SWM and 0; otherwise	Categorical	+
Access to private collectors' service	2 if enough access 1 if not enough access 0 if none at all	Continuous	+

CHAPTER FOUR

RESULT AND DISCUSSION

This chapter presents the main body of the paper. To achieve each specific objective of the study, the data obtained from survey are analyzed using different methods of analysis. Descriptive statistics is used mainly to the first two objectives. In addition, inferential statistics like t-test (for continuous variables) and chi-square (for discrete variables), and Econometric analysis are used to analyze the determinant factors of effective household solid waste management (the second objective). The data gathered to the last objective (focus group discussion data) are analyzed through qualitative method of analysis with some descriptive statistics.

4.1. Current Situation of Household Solid Waste Management in Ambo

This section is designed to analyze and briefly describe how solid waste management is practiced in the town, particularly solid wastes which are generated from households.

As per the survey result of the study and the researcher's personal observation, due to inadequate waste collection services, wastes were dumped in nearby river, open space, drain and/or burned openly. Even the households stated that the municipality by itself collects solid waste and burn in the surrounding of the community's living area. Such actions or failures of municipality really contribute a lot to environmental pollution and human health problems.

In addition, the survey result indicates that the lion's share of household solid wastes generation in Ambo is taken by plastic, paper, and ash, cattle feed and its wastes, respectively. It implies that the household solid waste generation is varied in type and rate depending on the living condition of the given household. This is also related with what has been found by Solomon (2006). He found that the generation rate and type of solid wastes is determined by the consumption habits and living condition of each household.

Table 4.1: solid waste storage materials at household level

kind of storage material	Frequency	Percent	Cum
Basket	47	23.5	23.5
Sack[3]	126	63	86.5
Plastic bag	18	9	95.5
Others	9	4.5	100
Total	200	100	

Source: survey result 2011

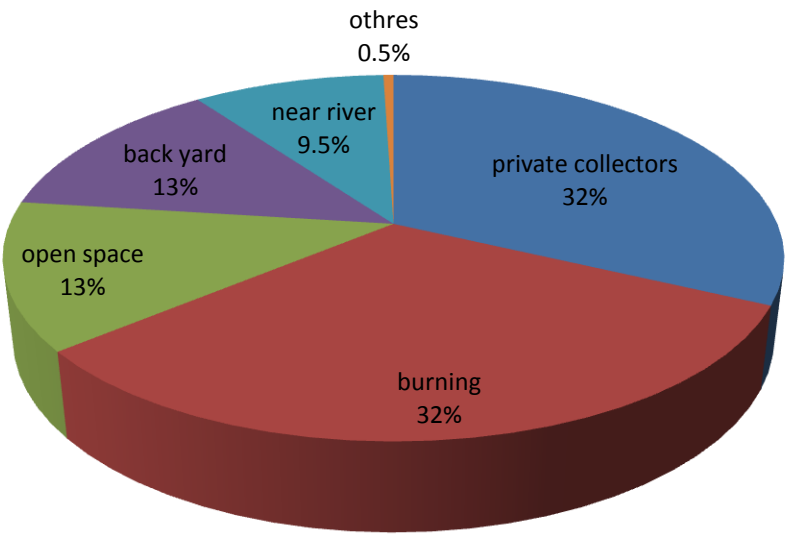
The selected sample households were also asked whether they had waste collection material (temporary storage) at home. All the respondents replied as they had temporary storage. With regard to the kind of storage they used, majority of the respondents (63%) used sack as waste storage, whereas, 23.5%, 9% and 4.5% of the respondents used locally made basket, plastic bags and other related storage materials respectively.

As one of waste collection facility, placing container in the town is very important for proper management. Therefore, the selected sample respondents were asked a question with regard to the existence of communal container in Ambo town. All respondents said no container is available in all places of the town. Moreover, the researcher also tried to verify the view forwarded by the respondent, and through personal observation the researcher also confirmed the absence of container in the city of Ambo. The key informants also stated that though the municipality recognizes the importance of container for waste management, because of budget related problem still containers are not assigned in any parts of the town.

Even if there is no solid waste storage container in the town that helps to dispose wastes properly, it is undeniable that by any means, the households should avoid their generated wastes from their surroundings. Due to this, the households were asked how they dispose off their solid wastes or what alternative disposal means do they have (see figure 4.1 below).

[3] The number of observation, who said "sack", includes the one who use 'madaberia', which is known in Ethiopia as local name.

Figur 4.1, alternative sites of households to dispose their solid waste



Source: survey result 2011

As one can see from figure 4.1 above, significant number of the respondents reflected that they used illegal ways of disposal system. It means that only 32% of the households regularly used private waste collectors' service. But the other alternative disposal methods are also within the category of illegal practice (68%). From those respondents who use unauthorized means of disposal sites, majority of the respondents (32%) answered as they simply burn wastes inside their fence. But about 13% of the respondents replied that they disposed their wastes in open space; similarly, about 13% of them were dumping their wastes on their back yard. In addition, from the selected samples, 9.5% and 0.5% were disposed their solid wastes in nearby river and other alternatives respectively.

The key informants of the study also stated that even though there are households, who really used private waste collectors, open burning of generated wastes is the major disposal system in Ambo.

From this one can understand that because of unavailability of container and inadequate private waste collector service, most of the households (68%) are forced to dispose their wastes illegally.

This finding matches with what has been stated by World Bank (2000). It noted that since the city administration often fails to provide adequate number of containers, households are motivated to dispose their wastes on road, in sewerage, inside the villages or other illegal places.

According to the researcher's personal observation and the responses from interviewees, these private waste collectors were at their infant stage (they did not have sufficient waste collection facilities to do their assignment). Due to this, the area/place where the households live in may be one reason for those who are not using the service of private enterprises. Therefore, the selected respondents were asked whether their living area is a factor for not the user of door to door waste collectors service (see table 4.2 below).

Table 4.2: Residential area and the accessibility of private waste collectors

Alternatives	**Frequency**	**Percent**	**Cumulative**
YES	36	26.47	26.47
NO	100	73.53	100
Total	136[4]	100	

Source: survey result 2011

As one can see from the table above, 73.53% of the respondents stated that their living area was not the preventive factor for waste collectors' services. But 26.47% of them said that their residential area has a great impact to access private waste collectors. Besides, the respondents who said "YES" also stated their reasons: private collectors are not well organized to handle the whole households of the town and are using push cart which is difficult to the concrete roads. Moreover, those households who said 'NO' were asked the question like "if your living area is not a constraint to use the private collectors' service, what do you think the other reasons?" Their responses were:

- we do not have information whether the private waste collectors are serving the society;
- we have enough open place at the back of our home;
- Economically, we do not have an affordable capacity to this service;

[4] It is not the total samples of the thesis; rather the number of sample households, who are not using the private waste collectors' service.

- We are living very near to a river (example 'Huluka' river at the center of the city);
- We can store and burn why we incur unnecessary cost.

One can clearly understand from the above responses that the municipality provided poor orientation/information to the households whether the door to door service is started and/or about the negative implication of improper solid waste management like dumping in the river, on the free space of their back yard, and store and burn it. Due to this, the households preferred to use any alternative as per their convenience. For example, if they have enough space in the back of their house, they would prefer to dispose on it; if they are living near to a river, they would prefer dumping in to it.

Table 4.3: the time of disposal that the household prefer to dispose their solid wastes

Time of waste disposal	**Households**		**Total**
	Illegal disposer[5]	**Legal disposer[6]**	
Early morning	71(35.5%)	0	71
Late morning	13(6.5%)	0	13
Afternoon	5(2.5%)	0	5
Early night	47(23.5%)	0	47
At the time of private collectors	0	64(32%)	64
Total	136(68%)	64(32%)	200(100%)

Source: survey result 2011

As can be clearly seen from table 4.3 above, from the total selected households, who disposed their wastes illegally, significant number of the respondents (35.5%) replied that they preferred to dispose off their wastes early in the morning. And also, about 23.5% of the illegal disposer households preferred to dispose their solid wastes at early in the night. The rest 6.5% and 2.5% of those illegal disposers often preferred late in the morning and afternoon to dispose their wastes respectively. However, all of the legal disposers responded that they disposed their solid wastes at the time when private waste collectors tour each household. Therefore, they store

[5] It refers to households who disposed off their wastes in unauthorized ways such as open space, in nearby river, on their back yards, burn it openly, on road side and other illegal disposal means (Memon, 2002).

[6] It refers to households who properly store wastes in their temporary storage and then either hand over to the private waste collectors, while they are visiting each door or dumping on the available containers or dustbins (Memon, 2002). However, as per the system of Ambo town, it refers to the one who directly hand over to the private waste collectors.

wastes in temporary storages at source and handover to door to door waste collectors at their regular schedule.

From this one can understand that most households who do not use the service of private waste collectors often prefer to dispose their wastes in unauthorized (illegal) places at the time of early night and early morning, which is out of official working hours.

4.2. Determinants of Effective Household Solid Waste Management: Descriptive Analysis

In this section, the researcher used various statistical tools in order to test the relationship between independent variables and dependent variable (effectiveness). Two – sample t test was applied to determine the relation or association between the dependent variable (effectiveness) and continuous independent variables (household head age, household's monthly income, members of the household, and household's year of stay in the town). Chi-square tests were performed to find out the relations or strength of association between effective household solid waste management and categorical independent variables (household head sex, educational level of the household head, the enforceability of the solid waste laws and regulations, the awareness level of households about solid wastes and its management, the respondents willingness to pay for the improvement of waste management, the distance between main road to residential house, and households access to private waste collectors services). Since some of the determinant factors are more of qualitative such as manpower, budget, and waste collection facilities, they are discussed or analyzed qualitatively. Therefore, for triangulation purpose the data collected from the staff of solid waste management sector are analyzed using both qualitative and quantitative methods of analyses.

4.2.1 Demographic Factors

Table 4.4, Descriptive statistics for households' demographic characteristics

Variable	Obs	Mean	Std. Dev.	Min	max
HHage	200	41.5	10.55	20	78
HHsex female)	200	.34	.48	0	1
HHedu	200	3.66	1.46	0[7]	6[8]
Ystay	200	22.19	11.41	3	60
incmon	200	2009.36	1267.95	136	5500
Fsize	200	4.85	1.68	1	10

Source: survey result 2011

I. Household Head Sex

Household head sex is one of the important determinant factors for the effectiveness of solid waste management at household level. The above household survey data indicates the relationship between household head sex and effective solid waste management.

As it is given in table 4.4 majority of the respondents (66%) are male-headed households. However, a comparison made between households, who manage wastes effectively and ineffectively with regard to sex revealed that relatively higher percent (51.56%) of households who manage its solid waste effectively is found to be female - headed households, whereas, 73.53% of the total households who manage solid wastes ineffectively in their home were found to be male headed – households (see Appendix 2). A result of chi-square statistics also verifies the existence of significant difference between households who manage wastes effective and ineffective ways on the base of household head sex at 1% significant level. The result depicts that the sex of averagely large number of households who manage its solid wastes effectively is female headed. In other words, there is a positive relationship between household head sex and effective solid waste management at household level (see Appendix 2).

This implies that unlike men, women headed households often preferred to dispose their wastes through private waste collectors in the study area. This finding is in line with Poswa (2004). He found that unlike men where their choice was a drop off centre women most of the time preferred a door-to-door waste collection system

[7] It refers to illiterate (i.e. education is a dummy variable, which leveled as 0 = illiterate; see chapter three)
[8] It refers to masters and above (similarly, education leveled as 6 = master's degree and above; see chapter three)

II. Household Head Age

According to table 4.4 above, the selected households' head constitutes various age groups from the minimum of 20 to the maximum of 78. Besides, particularly, the mean age of households who experienced in effectively and ineffectively manage solid wastes at sources is found to be 37.38 and 43.44 years respectively. Further the t-test also shows that there is significant at 1% level different between households who manage its solid wastes effective and ineffective ways with the reference of household head age (see Appendix 1). As per the data obtained from statistical tests, household head age and effective household solid waste management have a significant negative relationship at 1% level. It implies that when the household head age increase the effectiveness of household solid waste management would be decreases.

III. Household Head Educational Level

According to the table 4.4 above, the educational level of sample respondents range from illiterate to masters level. Specifically, from the total of 200 household head respondents, 4 percent are illiterate, 8 percent are elementary school graduate, 5 percent are junior, 22.5 percent are high school, 26 percent are diploma graduated, 30.5 percent are first degree graduate and 4 percent are second degree graduate (Masters Degree); when the educational status of the household heads is compared with household head sex, males are better educated than females (see Appendix 3).

Moreover, the researcher made a comparison between the household education level and its solid waste management. As clearly depicted in Appendix 2, when the household educational level improves, the effectiveness of household solid waste management level also improves. The result shows from the total samples who manage its waste effectively, 1.56% and 45.31% of household head is illiterate and first degree holders respectively, whereas, from the households who experienced in ineffective waste management, 27.21%, 19.12% and 4.41% are high school graduate, degree holders and master's holders respectively. Overall, the trends of household head educational level and the effectiveness of waste management at household level have a positive relationship (see Appendix 2).

The above finding from household survey is further strengthened by chi-square test demonstrating a significant positive relation at 1% level between effective solid waste management and household head educational level (see Appendix 2).

IV. Family Size

As stated in table 4.4 above, the selected household size ranges from 1 to a maximum of 10. The mean of household size is 4.85 percent. Besides, the average family sizes for households who manage solid wastes effective and ineffective ways are 4.64 and 4.95 respectively. This indicates that households who manage solid wastes effectively have, relatively, a smaller number of family members than households who manage its waste ineffectively (see Appendix 1). But the difference of these two groups of household is insignificant (i.e. the difference between 4.64 and 4.95). The two sample t-test also confirmed the absence of significant relationship between effective solid wastes management at household level and family size

V. Year of Stay

The average year of stay in the town is 22.2 years. The survey data also shows that household age and year of stay in the town are strongly related. The older the household head, the longer that she/he lives in the town. The average years of the households who applied effective and ineffective solid waste management have stayed in the town for 22.46 and 22.05 years respectively. Of course, it shows that there is no that much gap between the two groups of households. This finding is further strengthened by two-sample t-test, which shows the existence of insignificant relationship between the two groups of households.

VI. Monthly Income of the Household

The researcher investigated the influence of household income on the management of solid wastes in the study area. The output in table 4.4 illustrated that the average income of the household head is 2009.36 birr per month. The statistical test result depicted that (Appendix 1); there is a significant mean monthly income disparity between two groups of households (i.e. the mean income of households who manage solid wastes effectively and ineffectively accounts 2616.59 and 1626.26 respectively). Moreover, a two-sample t-test shows a significant mean monthly income difference between these two groups of households at the 1% level.

From this one can understand that higher monthly income earner disposed off their wastes in a legal way than lower income earner households at this particular study area. On the other side, since the demand and income have a positive relationship, the higher income earner households definitely would increase their generation of solid wastes than lower income earner households. However, even in this case apart from other factor it reveals that the higher income earner groups have a power to use the service of private waste collectors at any cost than the lower income group.

This finding coincides with what has been obtained by Medina (2010). He forwarded that though the higher income earners generate large amount of wastes, due to consuming different packed and other related foods, they have a power to catch up and dispose off their wastes in appropriate site speedily than lower income group households.

4.2.2 Socio – Cultural Factors

Socio-cultural factors are normally expected to have an influence on the effectiveness of household solid waste management practices. Since it mainly focused on people's attitudes and the patterns of waste handling, this section discussed, specifically, on the distance of household's living area from the main road (household's location), household's awareness towards solid waste management, and household's willingness to pay for collection services.

I. Distance from the Main Road (Location)

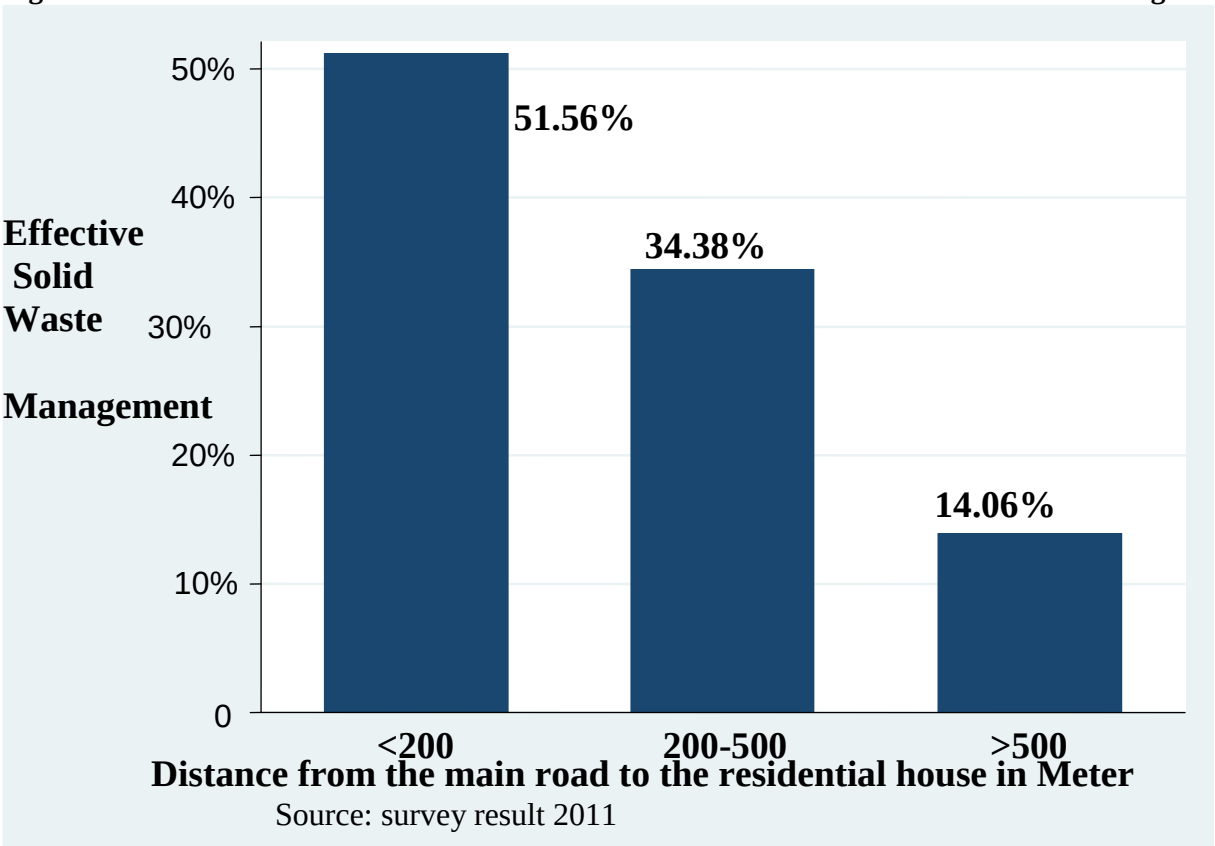
The distance of household's living area (location) from the main road expected to have a negative impact on effective solid waste management at household level. It implies that the far the distance of residential houses area (village) from the main road or asphalt, the lower the management level of solid wastes that generated at household level.

The data illustrated in Appendix 2 shows that from the total sample households, who manage wastes improper manner (ineffectively), majority of the respondents (42.65%) were living 200-500 meters far from the main road, whereas, from those ineffective management groups only small portion (29.41%) were living near to the town main road (less than 200 meters), where access is available. In contrary, from the households who disposed wastes properly (effectively), significant number of respondents (51.56%) were living near to the center, whereas, lower

percentage (14.06%) of those effective management groups were living far from the main road **(> 500 meters)**.

Moreover, as depicted in figure 4.2 below, distance of residents' location from the center and effective waste management have a negative relationship. The highest the distance in meter (greater than 500) the lower the effectiveness of household solid waste management (**14.06%**). This makes sense because, as per the researcher's personal observation and the responses of focus group discussants, the door to door waste collectors were existing at their infant stage (specially, they do not have adequate facilities to collect and disposed off wastes; rather they mainly use push carts). Therefore, it is difficult to serve the households who live the area (village) where far away from the main road and have concrete roads. Besides the inconvenience of roads to the capacity of waste collectors, the other implication is when the households' living location becoming far from the center, the residents might be encouraged to dispose wastes on free space, on road and/or in rivers. In other words, the far areas (village) by itself invite the households to dispose their wastes in unauthorized sites. That is why, as stated by some respondents, most of the time households, who are living around the center of the town and not the user of the private service, disposed their wastes on the other villages (areas) where far from their village (i.e. far from the main road).

Fig 4.2: the relation between distance from resident to center and effective solid waste management



Source: survey result 2011

Statistical test performed using Pearson chi-square also confirmed that the distance of households' location (village) make a difference in the effectiveness of waste management. Accordingly, the chi-square statistical test result shows the existence of significance negative relationship between effective solid waste management and household residents distance from the main road at 1% level (see Appendix 2).

II. Awareness

Having the understanding and good perception about solid wastes and its proper management is very crucial in order to manage the household solid wastes in a sustainable manner.

Therefore, to know the households' understanding or level of awareness on solid wastes and its management, selected samples were asked question about what solid waste means for them.

Table 4.5: household's awareness about solid wastes and their attitude towards its management

For households, solid waste means?	do you agree with the importance of solid waste management		Total
	YES	NO	
Useless	78 (39%)	15 (7.5%)	93 (46.5%)
Somewhat useful	82 (41%)	1 (0.5%)	83 (41.5%)
Useful	24 (12%)	0	24 (12%)
Total	184 (92%)	16 (8%)	200 (100%)

Source: survey result 2011

As per the given data above, from 200 respondents 46.5% stated that solid waste means totally useless. In addition, 41.5% and 12% of the selected households responded that solid waste mean somewhat useful and useful respectively.

Besides, the respondents were asked about their attitude towards the management of solid wastes. According to the survey result (see table 4.5), majority of respondents (92%) stated that they agree on the management of solid wastes. But 8% of them responded as they disagree with the issue of solid waste management.

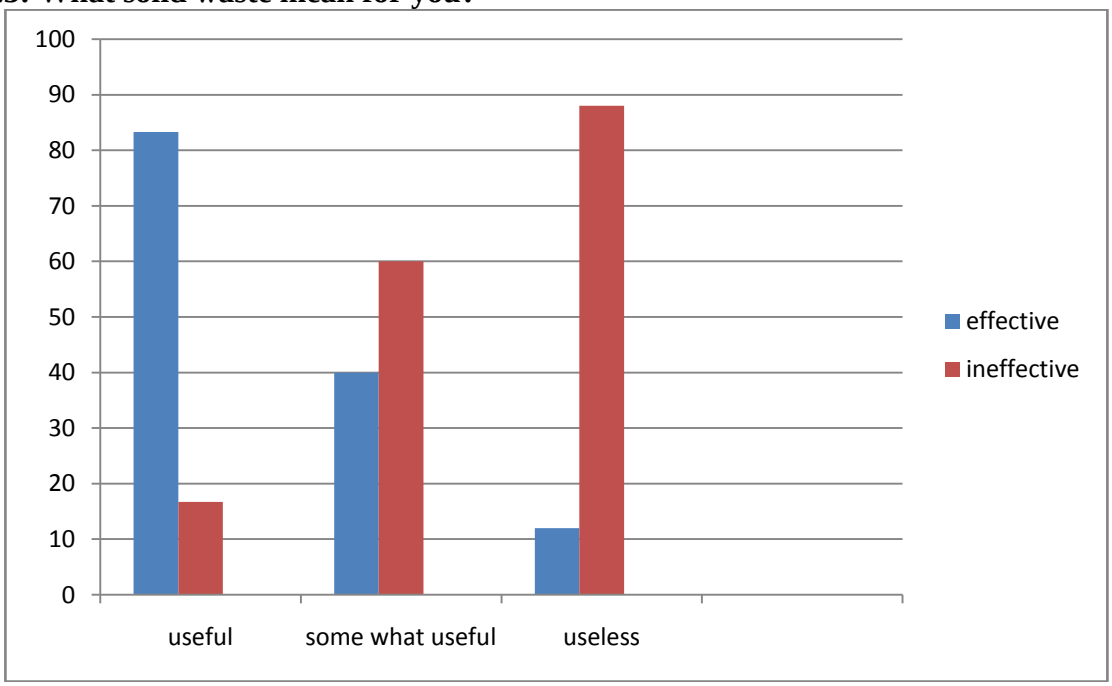
From this finding one can understand that the households have a good attitude or interest to collect and dispose off generated wastes in a proper way. However, they did not have information about the usefulness of solid wastes if it is to be managed well. Focus group discussants also stated that households have a positive attitude towards solid waste collection or management activities and to the private participants.

Moreover, in order to know the relationship between level of understanding and effective management of solid waste at household level, the researcher used bar graph (see figure 4.3 below). Therefore, one can understand that they have a positive relation. It means that from the total household, who replied solid wastes is useful if it can be managed in a proper manner, 83.3% were effective management group and 16.7% respondents were ineffective management group households. In addition, from sample households, who perceived solid wastes as somewhat useful, constitute 40% and 60% of effective management and ineffective management group households respectively. Moreover, from sample households, who understand solid wastes as totally useless whether it managed well, constitutes 88% from ineffective management group

households and 12% from effective management group households. In other words, the higher the households' perception or understanding to their generated wastes the higher the probability to manage it effectively (see figure 4.3).

From this survey result one can understand that the households' effectiveness to manage solid wastes can be improved when they recognized the usefulness of it.

Figure 4.3: What solid waste mean for you?



Source: survey result 2011

Before wastes are disposed or transported to the next transfer station, it should be separated and stored in temporary storage at source. Otherwise, it would be a cause for human health or environmental pollution and create difficulties to the further solid waste related activities. However, in order to perform such activity at source in a proper manner, the residents need to have awareness or understanding on the importance of separating wastes and the way how it can be separated.

Therefore, the researcher used waste separation practice as a measurement of households' awareness on solid waste management. Due to this, households were asked whether they are practicing solid waste separation in their house.

Table 4.6: Solid waste separation practice at household level

solid waste separation practice at household level	frequency	percent	Cumulative
YES	37	18.5	18.5
NO	163	81.5	100
Total	200	100	

Source: survey result 2011

As depicted on table 4.6, significant number of the respondents (81.5%) confirmed that solid waste separation issue did not apply in their home. 18.5% From 200 respondents stated that they collect and stored their solid waste separately based on its nature. Selected households who apply waste separation also stated their experience on how they separate it such as paper and plastics, food wastes (including onion and potato wastes), and cattle wastes separately stored in a temporary storage.

Table 4.7: The reason why the households did not apply waste separation at source

Reasons if households are not applying waste separation in their home	observation	%age	Cumulative
I do not have the understanding about waste separation	38	23.31	23.31
I did not think as it is my responsibility	45	27.61	50.92
I did not visualize the importance of separation	68	41.72	92.64
other reasons	12	7.36	100
Total	163	100	

Source: survey result 2011

Respondents who did not apply solid waste separation issue were asked why they did not practice it (see table 4.7 above). The reasons given by respondents for not applying waste separation in their home were different. Not realizing the importance of waste separation was the main reason (41.72%) for not applying solid waste separation. In addition, 27.61% and 23.31% of the sample respondents also stated that they did not think as it is their responsibility and lack of understanding or knowledge about solid waste separation were their reasons for not applying this separation issue, respectively. Again, the rest 7.36% of the sample households provided their responses as there are other additional reasons. Even some respondents stated that "what is the need whether it is separated or not".

From this finding one can understand that the households have inadequate information or lack of awareness related to the importance and the consequences of solid waste separation at sources.

Besides, as indicated in the above discussions, the awareness level of households on solid waste and its management is very low. But always it does not mean the households did not inform/orient by the responsible body; rather though they are informed, there may be less motivation to do so or the delivered information may not be relevant to improve their understanding.

Therefore, to know whether they have information or orientation about solid wastes and its management, the selected households were asked question like "did you get solid waste related information or orientation?"(See table 4.8 below).

Table 4.8: Solid waste related information or orientation

Information / orientation about solid wastes	**Frequency**	**Percent**	**Cumulative**
YES	140	70	70
NO	60	30	100
Total	200	100	

Source: survey result 2011

As illustrated in table 4.8, about 70% of the total respondents confirmed that they had information about solid waste and its management. The rest 30% of the selected households revealed that they did not have orientation or information related to solid waste issues.

Respondents who had information about solid waste and its management were asked how they got such information or orientation (see table 4.9 below). The ways how these respondents got information were different. From 140 respondents, who had information, 64.29% revealed that they got orientation from the health institution. 34.29% of the households confirmed that they got solid waste related information from 'kebelle' meeting. The rest 1.43% of the respondents revealed that they got information from different posters. There were no respondents who have got such information or orientation directly from municipality.

Table 4.9: The way how households got solid waste related information / orientation

Through what methods (means) did you get it if you have information on solid wastes?	Frequency	Percent	Cumulative
'Kebelle' meeting	48	34.29	34.29
Health institution[9]	90	64.29	98.57
Poster	2	1.43	100
Total	140	100	

Source: survey result 2011

Moreover, orientation related question also raised to the staff members of solid waste sector via interview. The findings from these staff members also confirmed that the municipality by itself did not provide any information or orientation to households. However, the municipal knew as the health extension staff is delivering door to door educational service to households. The main reason of the municipality for not delivering information to the household by its staff/plan was lack of manpower.

As discussed above, most of the households have solid waste related information from different sources. On the other hand, the above stated data also revealed as the households are facing awareness or understanding related problem. Therefore, in order to solve these contradictory results, it is important to discuss about what information, specifically, that the households got from different sources.

According to the information obtained from health extension sector head and its staff, solid waste related issue is one from their 16 (sixteen) health packages. Due to this, as per the sector plan, the staff (health extension program experts) offering door to door educational services about their 16 package including solid waste; but not by the initiation of municipality. Therefore, at the very beginning, they told to households in order to store their wastes and handover to the municipal vehicle when it comes to each door. However, as replied by health extension sector head, the vehicle is not functional. Due to this difficulty, now, they started to advice the households to dig hole and then burn it, at least to avoid waste accumulation from households'

[9] health institution provides information for households in two ways:
1. When the households go to health institution for the purpose of treatment
2. through City health extension program (recently designed program, even at national level)

surrounding. In addition, she said (the health sector head), though this is not recommendable (burning), it is better than other categories of illegal sites such as open space, river or sewerages. She also strongly replied as this was the last option.

As per the information obtained from different sources including health extension and solid waste sector staff, still the households did not have orientation about how to separate, recycle, even did not have clear information about the problems due to poor collection or management, the importance of effective management, the household's responsibility and other related basic information.

One can be clearly seen from the above discussions, the households' awareness level about solid waste and its management is assessed in different angles. Thus, all of the data obtained through interview and survey questionnaire indicated that the households have awareness problem with regard to how to manage or dispose off their solid wastes without environmental and other related problems. Of course, as indicated in table 4.9 above, most of the households replied that they obtained waste related information from the sources like health institution and sometimes in 'kebelle' meeting.

However, the given orientations were not related to the extent of households' responsibility, the consequence of ineffective management and the importance of effective management on public and environmental health, which can mobilize or initiate the interest and attitudes of the households to do so; rather they (the health extension staff) are doing as transmitting of instructions to the households. It means that they orient the households to store their wastes in temporary storage and then either handover to the municipality vehicle or private collectors.

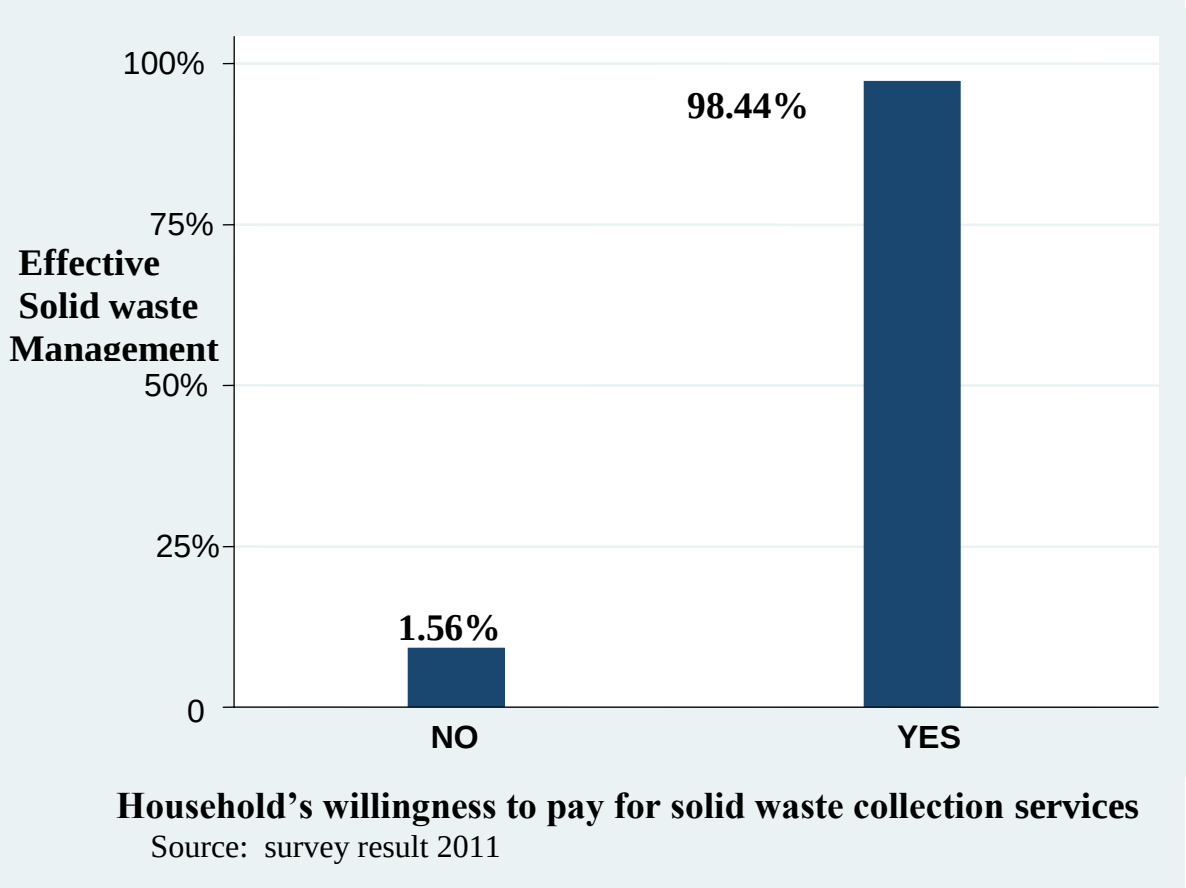
From this result one can conclude that such information or orientation cannot give a confidence to say they have adequate information or awareness about solid wastes and its management. This finding in line with what has been stated by Schübeler (1996). He noted that in order to develop awareness and then to have a positive attitude, the households should be informed appropriately. Specifically, orientations pertinent to the negative impacts of inadequate waste collection with regard to public health and environmental conditions, the value of effective disposal and their responsibility as waste generators should be appropriately disseminated to the public.

The statistical test performed using Pearson chi-square also confirmed that awareness makes a wide difference in effective management. Accordingly, the understanding level of effective management group household (95.3125%) is by far better than the understanding level of ineffective management group households (58.09%), (see Appendix 2). The result of Pearson chi-square test shows a positive relationship between effective household solid waste management and awareness at 1% significant level. Therefore, accepting the hypothesis stating households with high level of understanding are expected to manage solid wastes effectively than households with low level of understanding.

III. Willingness to Pay

As stated before, the households' willingness to pay for solid waste collection service is one of the crucial issues under these socio-cultural factors. The data in Appendix 2 shows that 98.44% of effective management group households were willing to pay for private waste collection services, whereas, 72.79% of ineffective waste management group households were willing to pay for waste collection services. On the other hand, 27.21% of ineffective management group households and only 1.56% of effective management group households were not willing to pay for door to door waste collection services.

Fig 4.4: Households' willingness to pay for solid waste collection services



Source: survey result 2011

The data on figure 4.4 also clearly shows the positive relationship between the household's willingness to pay for the improvements of solid waste management at household level and effective management.

The statistical testes using chi-square also confirmed that there is a significant positive relationship between effective solid waste management at household level and household's willingness to pay at 1% level.

However, as it can be clearly seen from Appendix 2, most of the households (72.79%) who managing their wastes ineffectively replied that they are willing to pay for the private waste collectors if the service is provided regularly.

Therefore, from this one can conclude that even though this variable has a significant positive relationship with the effectiveness of household solid waste management and 27.21% of respondents from ineffective management group households replied as they are not willing to pay because of economic potential as well as the existence of free space in their back yard, the households' willingness to pay is not currently a big issue as a cause for poor household solid waste management in the town.

4.2.3 Institutional Factors

The institutional factors are the main problems that highly influence household solid waste management in the town; or the main causes for the existence of such waste management related problems in addition to the previous determinant factors. In this section, the researcher investigated the influence of institutional factors on effective solid waste management; particularly, it includes law of enforcement, facilities (equipments), budget, manpower and accessibilities of private door to door waste collectors.

I. Law of Enforcement

This variable is expected to have a positive relation with the effectiveness of solid waste management at household level. In other words, if the households have awareness on the existence of solid waste related laws and regulation and also the municipality apply it, at least the rate of unauthorized site disposal would be minimized.

Therefore, to know whether the households were aware about the existence of solid waste related laws and regulations in the town and to what extent in which they are enforced or applied in to ground, selected respondents were asked questions (see table 4.10).

Table 4.10: Household's awareness about the existence of solid wastes related regulation and its enforceability

Do you know the existence of law and regulation about solid waste management	How do you evaluate the practice / enforceability of laws and regulation in the town			Total
	None at all	Regulation weak	Regulation strong	
YES	37(18.5%)	23(11.5%)	31(15.5%)	91(45.5%)
NO	-	-	-	109(54.5%)
Total	37(18.5%)	23(11.5%)	31(15.5%)	200(100%)

Source: survey result 2011

As per the data in table 4.10, about 54.5% of the respondents revealed that they did not know even whether the waste related laws and regulations are available in the town. The rest 45.5% of the selected households stated that they knew about the presence of laws and regulation.

Besides, the sample respondents who said "YES" (those who are aware about the availability of waste related law and regulation) were asked how they evaluate the practice / enforceability of laws and regulation in the town. From the total of 91 respondents only 15.5% of them stated that the enforceability of regulation is strong or municipal practically penalized the person who violates the rules and regulation. But majority of sample households (18.5%) responded that the enforceability of solid waste related regulation in the town is none at all. It implies that they did not observe any penalty related action, which is taken by the municipality because of illegal solid waste disposal. Finally, 11.5% of the selected samples also specified that the application or enforceability of solid waste regulation is weak (see table 4.10 above). This implies that related to waste disposal and environmental protection issues regional government intervention is really low.

The staff members were also asked these two questions via interview (i.e. the availability of law and its enforceability). Their responses were: Solid waste laws and regulations at regional level were designed or developed since 1993 E.C. With regard to its enforceability, in principle, it has two steps: warning and then penalize the violator of laws (i.e. 50 birr per household). As per the response of the interviewees, this enforceability of regulations is not that much followed in a regularly base.

The above finding is further strengthened by Pearson chi-square statistical tests. Because chi-square test clearly shows as the enforceability of by-law make a difference in effective management at household level. Accordingly, the test indicates a positive relationship between effective solid waste management and enforcement of regulation at 1% significant level (see Appendix 2).

From this one can understand that since awareness creation on the existence of solid waste laws and regulation and its enforceability are none at all or very poor, it is one of a serious cause or constraint for the performance of solid waste management in the study area. This finding

coincides with what have been found by Kaseva and Mbuligwe (2003). They stated that lack of awareness and enforcement of existing legislation and by-laws are the main constraints to solid waste collection service delivery.

II. Equipments (Facilities) for Solid Waste Management

Waste collection equipments play a significant role, whether they are highly mechanized or not, in the activities of solid waste management. Therefore, in order to know the role of these facilities on solid waste management of the town, the researcher assessed its status, particularly the storage containers and the collection vehicle.

Storage container

From the point of proper solid waste management with regard to human health, aesthetic value and the convenience of beneficiaries to use, the type, number, size and assignment (distribution) of storage container should be the main issue or concerns of responsible body of the particular area. On the other hand, unavailability or improper use of containers aggravated the problem of public health and beauty of the city or environmental health. Therefore, in order to know the status of the city with regard to container, the households and responsible staff members were asked container related questions. All of the selected households stated as there is no any container in all parts of the town. The solid waste management sector staff also responded the same answer as the households view.

The focus group discussants have indicated that the unavailability of container in the town is one of serious factors which prevent them from effective solid waste management practices. The households also responded that if the municipality placed containers in some part of the town, they can drop off their stored wastes properly without waiting the private waste collectors. But now they disposed off on unauthorized place by looking as the last alternative.

The key informant interviewees also said that since the municipality (we) did not provide containers or adequate door to door waste collectors; it is difficult to seriously follow up and penalize when the households drop off their wastes in unauthorized site (illegally). They further stated that, “That is why some times we advised the households to burn on their backyard”.

In addition, the result of Ambo municipality assessment (2010) also revealed that since there are no garbage containers placed at different corners by the municipality for the collection of wastes, every household has to collect the garbage in a sack or basket and then loads it on the truck when it tours in 'kebelles'; otherwise the community burns the wastes on their own initiative.

Moreover, the researcher took this variable as one of the main determinant factors in the logistic regression model. But as discussed above, since the whole respondents said there is no container in the town, it did not show a variation between two groups of households (effective and ineffective waste management) for comparisons. Due to this, the STATA software dropped the variable from regression analysis. Therefore, it is impossible to show relationship between availability of container and effective management through statistical test and Econometrics analysis significant level.

From the above finding one can understand that unavailability of container is a serious problem in Ambo solid waste management activity.

Collection vehicle

The other leading problem that influences the household solid waste management system in the town is the functionality of vehicles. According to the head of the town's greenery and beautification sector, the municipality has one vehicle for solid waste management purpose which gave waste collection service for many years.

The key informants said that since the vehicle served the town for many years, it could not serve any more. This data supported by the Municipality assessment result: A truck which is used for solid waste collection and disposal is not always giving service due to spare part problem and most of the time it enters in garage for maintenance (Ambo municipality, 2010).

Besides, the focus group discussants also stated that the municipal did not give attention to solid waste management. This is because most of the time the vehicle is taken to garage and no container is assigned in the town but the responsible body did not observe to find a solution for such serious problem by taking as a big issue.

IV. Budget

The budget assigned for solid waste related sector (greenery and beautification sector) has a great impact on the service delivery performance of the sector. In other words, if the sector has been given sufficient budget or has adequate sources of finance, it can fulfill the necessary facilities that support to manage solid wastes in a proper manner. Due to this, the available budget or financial source is one of the main constraints for effective solid waste management. Hence, in order to know the reality of Ambo, the necessary data gathered from staff through interview and analyzed as follows.

According to the head of greenery and beautification sector, the only source of income for solid waste management activity is the municipality income, which is collected from the people through tax[10]. Apart from this, the municipality did not have other sources of income which can support for the improvement of solid waste management service. Even the households did not pay specifically for solid waste related activities. Of course at the time of beginning, world health organization (WHO) purchased push - carts (hand carts); otherwise, currently there is no any other NGOs and government organization or agencies that support the SWM activities.

Besides, the key informant interviewees said that the budget assigned to solid waste management is inadequate to run the service in a proper manner. According to the greenery and beautification head, the municipality budget is assigned from internal income; from this budget, only some portion is given to solid waste related purpose; rather the rest are assigned to other city's basic development. Concerning this, his expression (reply) goes as follows "that is why the sector did not provide containers at least in some parts of the city, permanently solve vehicle related problem and other necessary facilities". The findings like little emphasis by the responsible body and small portion of budget is assigned to solid waste management activities are similar to that of Solomon (2006).

From this finding one can understand that the financial source of the sector is only small portion of municipal budget, which is really crucial. Due to this, the sector faced lack of capacity to

[10] It refers to the annual payment of households that imposed by the local government/municipal. Specifically, for this study it includes the annual tax which is collected by the municipal like place tax and other taxes, but not for the purpose of solid waste management.

purchase and provide necessary facility in order to confirm effective solid waste management in the town. This finding coincides with what has been found by Zurbrügg and Schertenleib (1998). They found that because of lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities and insufficient funds from a central municipal budget cannot finance adequate levels of service; again municipal solid waste collection scheme of cities in the developing world generally serve only a limited part of the urban population.

V. Manpower and Technical Factors

Manpower and technical factors are also the main problems in household solid waste management activities. Due to the fact that the existence of insufficient manpower, a particular city faced solid waste related problems. Moreover, even the available human resources did not have the necessary expertise for solid waste related operations and planning.

As stated in Appendix 4, solid waste management sector (greenery and beautification sector) faced both scarcity of human resources and even the problem of manpower that have technical skill to operate and properly manage the sector. According to the result, from the total staff members, there is no one from environmental science or other related fields. Besides, the interviewees were asked whether they got training with regard to their assigned profession. All staff members did not get or participate in any training session. Of course, the head of the sector has got a chance to participate in one workshop. They further said that "let alone by the initiation of the responsible body, we told them to arrange at least one as training is basic for the effective and efficient of the sector; but no one give attention to such request".

From this one can understand that the staff members of solid waste management activity in Ambo did not have technical skill that help them to operate the given task and also did not get training, which is related to management of solid wastes in a sustainable way. Hence, scarcity of manpower and lack of technical skill is one of the other main constraints of effective household solid waste management in the study area.

This finding is in line with what has been found by Puopiel (2010). He found that adequate number of human resources, technical skill to operate the system and training are the crucial point for the success of solid waste management activities. However, with the reality of

developing countries, many officers in charge of solid waste management, particularly at local level, have little or no technical background or training in management.

VI. Accessibility of Private Door–to-Door Waste Collectors' Services

The full responsibilities of solid waste management activity are handled by the town municipality. But as stated earlier, the capacity of the municipality did not permit to serve the whole households of the city. Due to this fact, before two years, the municipality established private door to door solid waste collectors; then the municipality change its focus from collecting wastes to regulate the activity and providing necessary facilities; given that the private participant should collect wastes from each door as per regular schedule.

This variable was expected to have positive relationship with effective household solid waste management. Therefore, the researcher investigated the accessibility of both household groups, who manage solid wastes ineffectively and effectively.

As stated in Appendix 2, 72.79% from the total households, who manage solid waste in an ineffective manner, replied as they do not have any access of private waste collectors' services; whereas, 22.06% and 5.15% of them responded that they have inadequate access and enough access respectively. On the other hand, from the total sample households, who manage its solid waste effectively, 67.19% and 32.81% stated that they have inadequate and enough access of private waste collectors' services respectively; whereas, no one said that they do not have access at all. Respondents, who replied no access at all, further stated that "even we did not know about the existence of door to door solid waste collection service providers in our city".

The above findings are also strengthened by the Pearson chi-square statistical tests. Accordingly the test result shows that private collectors' service access and effective household solid waste management have a significant positive relationship at 1% level.

From this result one can understand that most of the households, who manage wastes ineffective ways, do not have an access to private waste collectors' service, whereas, the households who experienced in effective waste management have adequate access to such services. Thus, because of lack of access to dispose wastes properly, they are forced to dump on unauthorized sites (illegal disposal means).

4.3. Determinants of Effective Household Solid Waste Management: Econometrics Analysis

In order to answer the second research question (specific objective), the researcher tried to use Econometric analysis, with the help of STATA10 version software, in addition to descriptive statistics. Due to this, as indicated in methodology part, logistic regression model was applied to this particular study.

Prior to running the model a through diagnosis of the data and the variables has been taken so as to ensure the goodness of the model fit. Classical tests for heteroskedasticity (**robust standard error**) and for model specification **linktest**, which is STATA command to test specification error, were made. When the command ***linktes***t used after regression, the result box would be displayed two new predictor variables that help to check whether the model is correctly specified (i.e. **_hat and _hatsq**). Then by looking the p-value confirm as **_hat** is significance since it is the predicted value and **_hatsq** is insignificance because if the model is specified correctly, the squared predictions should not have much explanatory power (Yesuf, 2009). Besides, for normality test the researcher used the STATA command **ladder.** The result box of this command displayed chi-square with transformation (like log, square, square root and others). Then look for the transformation with the smallest chi-square (Yesuf, 2009). Moreover, for multicollinearity test the researcher used **correlation matrix**; in this test result, as a rule of thumb, if the correlation between two independent variables are less than 50%, it is expected as the variables free from multicollinearity problem. Hence, the data and variables met the assumption underlying the logistic regression model.

Accordingly, as per the data indicated by multicollinearity test, household's monthly income was excluded from the regression. This is because of the existence of association between household's monthly income and household head educational level (see Appendix 10). Of course their association was not that much strong though it is more than 50%; but the household's monthly income creates a serious problem in model specification in addition to its correlation with household head educational level. Therefore, the researcher decided to drop off household's monthly income from logistic regression.

The result of normality test showed that, most of the variables are normal except two (household head educational level and family members). Hence, depending on the test output, education was transformed to squared, whereas, family size was transformed to square root to correct non-normality (see Appendix 11). After various diagnoses of the data and variables, the researcher ensures the fitness of the model. Thus, logit model was estimated to see the effect of expected determinant factors of effective household solid waste management in the study area. The results of the model presented in table 4.11 below.

Table 4.11: Logit result for determinants of effective household solid waste management

dependent variable (effectiveness) categorized as:
1 if households manage wastes effectively; 0 otherwise

Explanatory variables	**Coef.**	**Robust Std. Err.**	**Z**	**P>|z**	**[95% Conf.**	**Interval]**
HHage	-.0286906	-.0450571	0.64	0.524	-.117001	.0596198
HHsex	1.550173*	.6536004	2.37	0.018	.2691393	2.831206
Ystay	.0263143	.0322329	0.82	0.414	-.036861	.0894895
Dist	-.7777995*	.3406312	-2.28	0.022	-1.445424	-.1101745
MSEaccess	2.925079**	.5793605	5.05	0.000	1.789553	4.060605
Aware	2.737126**	.8108659	3.38	0.001	1.147858	4.326394
Willin_pay	4.709258*	1.951097	2.41	0.016	.8851788	8.533337
Educ	.1009161**	.0353143	2.86	0.004	.0317014	.1701308
Fmsize	1.176976	.8995166	1.31	0.191	-.5860446	2.939996
_cons	-12.48815	3.436594	3.63	0.000	--19.22375	-5.752546

Number of obs = 200
Wald chi2 (9) = 55.58
Prob > chi2 = 0.0000
Log pseudo likelihood = -47.030738
Pseudo R2 = 0.6249

Source: model output 2011
Note: ** 1% significance level, * 5% significance level

As indicated in table 4.11 above, the overall significance and fitness of the logistic regression model is determined by its chi-square value. The chi-square value is pr = 0.0000; hence the explanatory variables can significantly predict the dependent variable.

As per the model result presented in table 4.11, household head sex (5% level), household head education (1% level), the distance of household residents from the main road (5% level), access to private solid waste collector's service (1% level), household's awareness towards solid wastes and its management (1% level) and household's willingness to pay for private solid waste collector's service (5%) are significant. However, the logit result (table 4.11) shows that the influence of household age, years of stay and Family size on the effective household waste management are not statistically significant.

Table 4.12: Marginal effect reports with in logistic regression

Marginal effects after logit

y = Pr (effective) (predict)

= .09009729

Variable	dy/dx	Std. Err.	Z	P>|z|	[95% C.I.]	X
HHage	-.002352	.00315	-0.75	0.455	-.008526 .003822	41.5
HHsex*	.1598328	.08891	1.80	0.072	-.014436 .334102	.345
Ystay	.0021572	.00255	0.85	0.398	-.002845 .00716	22.19
dist	- 637638	.03578	-1.78	0.075	-.133885 .006357	1.87
MSEacc~s	.2397973	.07578	3.16	0.002	.091274 .388321	.645
aware*	.1693594	.06183	2.74	0.006	.04817 .290549	.7
willin~y*	.1928457	.05292	3.64	0.000	.089121 .296571	.81
educ	.0082731	.0036	2.30	0.022	.001216 .01533	15.205
fmsize	.0964882	.06816	1.42	0.157	-.03711 .230087	2.16702

Source: model output 2011

(*) dy/dx is for discrete change of dummy variable from 0 to 1

As discussed in the above paragraph, the effect of independent variables that estimated in logistic regression presented by using the coefficient sign and P- value of each predictor variable. However, the interpretation and/or meaning of each significant predictor variable in this particular study conducted by using its marginal effect below. The marginal effect explains the

marginal effect of predictor variable on dependent variable in terms of probability (see table 4.12 above).

Sex of Household Head

As stated in various literatures, household sex is indicated as one of main demographic factor that influence the status of household solid waste management system. Due to this fact, this variable was hypothesized that women headed households have better chance to manage their solid waste effectively than men headed households. As expected, in logistic regression the coefficient for household head sex was found to be positive and significant at 5% level. It implies that women headed households are showing better solid waste management than men headed households. Table 4.12 also shows that the possibility of effective solid waste management at household level increase by 16% as household head sex changes from 0 to 1 (i.e. household head sex is a dummy variable; 0 = male and 1 = female, as described in methodology part). In other words, when the household head is being female, the possibility of effective solid waste management at household level increases by 16%. This finding was found to be consistent with what had been found by (Poswa, 2004; Woroniuk and schalkwyk, 1998; and Bizatu and Negga, 2010)

Education of Household Head

The other determinant factor of effective household solid waste management is educational status of household head. In light of this, it was estimated that households lead by educated individual have a chance of managing its solid waste effectively than uneducated one. As hypothesized, the coefficient of household head education in the model result was found to be positive and significant at 1% level. It indicated that more educated household heads are better in the management of their solid wastes than the rest. In other words, the level of education attained by the head of household has a significant effect on the effectiveness of solid waste management at household level. This result fits to this existed theoretical evidence that educational improvement could leads to household's awareness about the impact of inappropriate solid waste management on environment and human health.

Moreover, the interpretation of this variable coefficient is that the probability of effective household solid waste management increases by 0.8% as the educational level of household

heads improved one step. This is in line with the finding of (Jenkins, et al, 2000; Kamara, 2006; and Bizatu and Negga, 2010).

Distance from the Main Road (Location)

Among the explanatory variables, distance of the household residence from the main road is the one. In this study, distance was hypothesized as the households could be encouraged to dispose off their solid wastes in unauthorized place while the household's living area far from the main road or the center of the town. Related to distance issue, Tewodros (2006) found that the distance of container, which is placed in the city, from household residence has a negative relation with the probability of dispose off solid wastes in appropriate place. As expected, this variable is significant at 5% with negative sign. It indicated that households who are living relatively near to the main road or to the asphalt have a chance to manage their solid wastes effectively than the one who live relatively far from asphalt or from main road of the town.

More specifically, the marginal effect coefficient for this variable (see table 4.12 above) can be interpreted as increase the distance of household's residence from the main road or asphalt by one meter decreases the possibility of effective solid wastes management at household level by 6.3%. It makes sense because, as in-depth discussed before, the municipality vehicle is not mostly in service and the private waste collectors do not have adequate facility (equipment) that convenient to non-asphalt road and to the houses who far away from the center of the town. Therefore, increase the probability of disposed off solid wastes in unauthorized or inappropriate place by the households as the distance of residence from the main road increases. The finding of this study was consistent with what had been found by Tewodos (2006)

Access to Private Solid Waste Collectors

In a similar fashion, the explanatory variable Access to private solid waste collectors, which defined as the accessibility of private door to door solid waste collector's services to the households, is one of the determining factors to the effectiveness of solid waste management at household level. It was hypothesized that the possibility of effectively managing household solid wastes by the generator increase as the accessibility of private solid waste collectors increase. As expected, the coefficient of this variable was found to be significant at1% with positive sign. It

indicted that, households who have an access of private solid waste collector's service are relatively managing their wastes effectively than the others. As presented in table 4.12, the interpretation of this variable coefficient means that as the household's opportunity to access the private solid waste collector's service increase by one step further (i.e. from 0 to 1 to 2), the probability of effective solid waste management at household level increase by 24%. In other words, when the accessibility of private participants on door to door solid waste collection services improved from 0 to 1 to 2 (meaning: access to private collector was a categorical variable that defined as 0= no access at all, 1 = not enough access and 2 = enough access to private waste collectors; see in methodology part), the effectiveness of household solid waste management also increases by 24%.

This finding give sense with the reality of the study area because, as stated in descriptive part, there is no container in all parts of the town and also the municipality's vehicle mostly entered in to garage for maintenance. Due to this fact, when the household's opportunity to access or use the private solid waste collection's services decrease, the households would be encouraged to disposed off their solid wastes in unauthorized or illegal place. The finding of this study was consistent with what has been found by (Zhu, et al., 2008; Zahur, 2007; and Longe, et al, 2009).

Awareness

As pinpointed in various literatures, this explanatory variable is one of the determinants of effective solid waste management. Awareness is used as indicator of households' understanding towards solid waste and its management by taking whether the respondents got necessary orientation or information as a bench mark. It was hypothesized that households, who have information or awareness on the importance of dispose off wastes properly , the negative consequences of choosing unauthorized place to dump wastes and others that relevant to improve the management system, can manage their solid wastes effectively; even by the initiation of themselves. As expected, the coefficient of this variable shows as it is significance at 1% with positive sign. This indicated that household's awareness towards solid waste is one among the important variables that make the households to manage their solid wastes effectively.

More specifically, the result of this variable can be interpreted as the level of households' awareness increases, the probability of effective solid waste management at household level

would be increased by 17%. The finding of this study was found to be match with what has been found by (Zhu, et at, 2008; Kamara, 2006; and Schübeler, 1996).

Willingness to Pay

The variable willingness to pay is significant at 1% with positive sign. It indicated that household's willingness to pay for waste collection service is one among important variables that make the households to manage their solid wastes effectively. The households' willingness to pay for the solid waste collection services has its own serious impact on the improvement of solid waste management system, particularly to the city that follow door to door collection system than communal container collection system. In a similar fashion, it was expected that the households who are willing to pay for door to door collection services relatively manage their solid wastes effectively than households who are not willing to pay such services.

Moreover, the marginal effect of this variable can be interpreted as the household's willingness to pay changes from 0 to 1 (i.e. willingness to pay is a dummy variable; 0 = not willing to pay and 1 = willing to pay), the possibility of effectively manage solid wastes at household level also increase by 19%. In other words, when the households shift their stands from unwilling to willing to pay for collection services, the probability of effective solid waste management at household level also increases by 19%. The finding of this study coincides with what had been found by Longe, et al (2009).

4.4 Service Delivery Performance of Private Solid Waste Collectors

In this section, the researcher applied more of qualitative way of analysis in order to answer the third specific objective. Besides, more of the data that are necessary for this section were collected directly from private waste collectors through focus group discussion.

Solid waste management should not be the task of local government; rather for the purpose of efficient and effective service or disposal system the role of all stakeholders including the involvement of private enterprises are very important. In a similar fashion, private waste collectors have been established in Ambo by municipality to improve the waste management system in the town. However, giving a chance for private youths to participate in solid waste

management by itself is not enough; rather the performances or each movement of the private participant to do their given assignment is also crucial.

Hence, it is necessary to examine the performance of these private solid waste collectors. That is why the researcher took as one specific objective (i.e. third objective). In this section the establishment, households' attitude, the challenges when providing service and other related issues of private participants are discussed.

4.4.1 Establishment and Progress of Private Solid Waste Collectors in Ambo

As stated earlier, since the municipality recognized the contribution of private collectors on the effectiveness of waste management, the town small and micro enterprise office organized jobless youth, as cooperative, and gave the responsibility of door to door waste collection; given that they were under the immediate controller of the town municipality. At the time of establishment, as said by the sector head, their number was 14 and the facilities like hand cart and free space as secondary storage (transfer station) were given by the municipality. However, he further stated that other facilities such as full cloth (i.e. waste gown and glove), shoes, eye glass, and health guarantee or security were not provided because of financial problem. This may result in inadequate waste collection services and/or area coverage from private participants' side.

In addition, since private waste collectors used push cart while collecting household solid wastes, it is difficult to dispose off their collected wastes on the available dump site, which is relatively far from the center of the town. By considering such problem, in the very beginning, the municipality promised to these groups as they can give its vehicle when it is needed. However, the vehicle is mostly taken in to garage for maintenance instead of in service area. Thus, they did not get the vehicle service timely.

As noted by key informant interviewees, these organized and formal private solid waste collectors cannot proceed for a long time on their given task; rather they disintegrated themselves and then the whole responsibilities were turn back to the municipality. They further stated that the reason why these waste collectors preferred to disintegrate: because of financial problem the municipality did not provide necessary facilities.

Moreover, the staff members were asked about the current private door to door solid waste collectors. They stated that the municipality established the other jobless youth for this activity in the year 2003 E.C. they are seven in number. After knew the existence of newly established private waste collectors in the town, the researcher preferred to discuss with them (private waste collectors) through focus group discussion in order to know or examine their current performance and also identify their challenges when they provide waste collection services.

The focus group discussants responded that the only main reason why they initiated for such activity was their joblessness. They further stated that "we ourselves make group and asked the municipality as we need to involve on solid waste management system of the sector".

The financial source of these door to door collectors is the revenue that will be collected from the service beneficiaries. The amount of money that beneficiaries paid differs depending on the generators (residential house and commercial house). According to their response, for households from 10 to 20 Ethiopian birr (per month) depending on the volume of wastes and for commercial houses (i.e. since they serve some hotels and restaurants too, which are existed on the asphalt) from 50 to 100 Ethiopian birr (per month). However, this payment is solely determined by door to door collectors. They were asked about the feeling of households with regard to monthly payment. They said that till there is no households who provided complain about payment.

This finding was strengthened or supported by the result of household survey questionnaire. Accordingly, households were asked whether the private solid waste collectors' service payment is fair. As indicated in Appendix 12, significant number of respondents (65.63%) confirmed that the payment to waste collectors' service is fair. From the total of sample households who use the service of private waste collectors, only 34.38% replied that the payment is not fair.

Focus group discussants further explained that their stand was to collect and dispose off solid wastes from anyone who is interested on their service and payment; otherwise if the households are not interested to use the collection service, they have a chance to find other means for their wastes disposal, either legal means like municipal vehicle or illegal one like open space. It is not the tension of the private waste collectors. In other words, the household, who wants to use the

service and can afford the given price, has an opportunity to be served by these private participants.

From this one can understand that the follow up of municipality on the progress and satisfaction of private participant and also on the problem of the households with regards to waste collectors are very poor or none at all. Besides, the households who did not afford the determined payment and also can afford but lives far from the center did not serve by these waste collectors. Moreover, the municipality did not provide other alternative waste disposal means for such households. Thus, since these households should removed wastes from their home, they forced to dispose on unauthorized disposal sites (means).

4.4.2 Households' Attitude towards Door to Door Waste Collectors' Service

As it has been discussed in descriptive part, the attitude or perception of households towards solid waste and its management has a serious impact on its effectiveness. Likewise, the households' attitude or view about solid waste collectors and their services is important for their service delivery performance.

According to focus group discussants, the households have a good attitude and perception towards our services and activities in general. Besides, they said that let alone the permanent clients (households), a number of households who are not served by the private collectors' service always ask to pick up their wastes like others. Further they stated that the society in general really gave a good attention and respect to the private solid waste collectors. However, the main problem that prevents the private waste collectors from serving the whole households is waste collection facilities, which is expected to be offered by the municipality.

This focus group discussion result is highly supported by the household survey questionnaire. In order to examine the current service delivery performance of private door to door solid waste collectors, the researcher designed question on such issue and collected data from the households that currently use their service. The researcher believes that since these sample households are currently using the service of waste collectors, they could know the service delivery performance of private waste collectors (see Appendix 12).

As clearly shown in Appendix 12, on the view of households, the private solid waste collectors serve the society in the good way and have appropriate skill and commitment. According to the given data, majority of the sample households responded that the private solid wastes collectors treat households equally (68.75%), they had adequate skill (59.38%), they were collecting solid wastes from each residents at the right and needed time (71.88%), their payment received from the household was fair (65.63) and also in a general evaluation the private solid waste collectors are committed to deliver their service (73.44%). On the other hand, only 31.25%, 40.63%, 34.375%, 28.13% and 26.56% of the respondents stated (reported) that the private waste collectors did not treat all households equally, they did not have adequate skill for solid waste collection and management, the payment was not fair related to their services, they did not take wastes from residents at the right time, and generally they were not committed to render their services respectively.

From this result one can understand that the private solid waste collectors have a good match with the households who are using their service. In other words, the private solid waste collectors have relatively required skill. Due to this, they are treating households equally in terms of timely collecting wastes with fair payment. Because of this, on the view of service user households, the door to door solid waste collectors are committed to provide their services.

Moreover, significant number of respondents (65.63%) shows that the Ambo town private solid waste collectors did not have adequate capacity to cover all areas of the town. On the other hand, only 34.38% of the households stated as they had required capacity to do their assignment.

This capacity related finding also strengthened by the result of focus group discussion data. According to the discussants, since the municipality did not provide the necessary facilities such as transfer container, vehicle, adequate cart, and others, it is difficult to serve households equally with efficient operation.

4.4.3 Private Door to Door Solid Waste Collectors' Problems and Challenges

As one can be clearly understand from the above discussion, even though the Ambo private solid waste collectors have skill and are committed to serve the households with fair payment and equal treatment of the households, they are not well organized and do not have adequate capacity

to cover the whole areas of the town. It indicates that by one and/or the other problems these waste collectors cannot collect solid wastes from the whole households and their operation is inefficient. If this is the fact, from others, inadequate capacity and inefficient operations are the serious problems of private solid waste collectors.

This finding is in line with what had been stated by Zurbrugg (2003). He confirmed that inadequate service coverage and operational inefficiency of service is the main from Solid Waste Management typical problem areas in developing countries.

Hence, the next paragraphs are presented the reasons how these inadequate service coverage and operational inefficiency related problems happened in Ambo from private solid waste collectors' side.

According to the focus group discussants, they are interested to do more than what they are doing but they could not because of various reasons. The main reasons why they have covered only small area of the town and being operationally inefficient are: generally, lack of necessary facilities and lack of incentives. The detail explanation of each problem is stated as follows:

The first and the main reason is lack of facilities. The municipality did not provide adequate necessary facilities like transfer container, vehicle, job cloth (waste glove, eye glass and waste gown), shoe and others that are very important to deliver the service effectively. They further explained that this facility related problems like: because of lack of transfer container in the town, solid wastes collected from each home, as possible, and then should be disposed through push cart on the dump site, which is far from the center of the town. Since the road is concrete except the main road of the town, the distance from the center to dump site is so far, the member of the group are seven only and the tools used to transfer wastes is hand cart; it is very difficult to do more. This is because it needs more time and more potential (manpower). It may results, with in regular or scheduled time, waste collectors could not serve most of the households; even difficult to properly covered households who live nearest to the main road. However, as per their response, if there are containers as a transfer station, solid wastes, which collected from each household, can be transferred to the container with in short period of time and can cover a number of households per day.

In addition, with regard to lack of facility they also indicate that there is no availability of the required track or vehicle which is one of the best means to dispose waste. Nevertheless in the study neither the existed car is properly functioning nor the effort made to replace as it is sufficient. As a result the role played by both, municipal and private is insufficient which effect to lot of health and environment complications.

Moreover, the facility, specifically job cloth (waste glove, eye glass and waste gown) did not provide by the responsible body. It makes sense because when one observes the private solid waste collectors when they are serving the households in every morning, he/she could not see them with job cloth. In addition, one can confirm this finding from Appendix 5.

The second problem of private waste collectors is lack of incentives (it includes providing training service and health security/guaranty to the waste collectors). Most of the time because of lack of incentives, which is given to the private enterprise from the city administration, the enterprises could not be encouraged to do well and even they want to shift their job.

Due to this, the discussants were asked about incentives. Their response was the responsible body did not provide incentive including training with regard to their responsibility to these groups of waste collectors. They further stated that "let alone incentive, they did not follow us whether we are doing well". This implies that the municipal or other responsible body did not give any of incentives in order to initiate the private waste collectors to do more; rather it organized these jobless youth and gave a single push cart with the area from where to where they should serve. This is creating a discouraging environment which is result in carless for the given activities or performing the given responsibility with no moral/internal initiation. The discussants further responded that if they got other job whatever it is, they will resign from such involvement.

Finally, door to door solid waste collectors strongly said or suggested that if the municipality fulfilled the above stated facility, at least transfer container, job cloth and vehicle, all of the members are ready to collect wastes from each household regularly.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusions

Solid waste management is being a serious agenda in the world since it is a major cause for environmental pollution and human health risks. Mostly observed serious problems especially in low income level countries are inadequate collection, storage, treatment and uncontrolled disposal of solid wastes in open dumps which easily expose to harsh hazards like environmental pollution and health problem. It is confirmed that only 30-50% of generated wastes in developing countries are collected and managed properly; but the rest are disposed off in unauthorized sites. Therefore, just like other developing countries, this data and severity of waste related problems are the big concern of Ethiopia. That is why, in order to improve waste management system, it developed a new solid waste related law (proclamation) in the year 2007 at national level and distributed to all administration units of cities including Ambo town.

The lion's share of household solid waste production in Ambo is taken by plastic, paper and ash respectively. It implies that, the type and rate of household solid waste production are varied depending on the living condition of each household. According to the result, all of the households have temporary storage in their home. The town municipality did not assign solid waste container in any parts of the town; rather, they orient the household to store their wastes and handover to the private waste collectors or municipal vehicle when it tours in their village. However, only 32% of them are dispose off in a proper manner (effectively manage wastes), whereas, the rest 68% are used unauthorized disposal sites such as open space, in river, burning and back yards (ineffectively manage wastes).

Households, who used unauthorized (illegal) site, mostly preferred to dispose their wastes at the time of early night and early morning. Moreover, the respondent households replied that sometimes the municipality also collected wastes, which are disposed by the households on free space, and removed through open burning. Thus, all the above discussions can be witnessed that

the current situation of household solid waste management in the town is very poor and in need of a solution.

From demographic variables, household head sex and educational level show significant relationship with effective solid waste management at household level with a positive sign. It implies that household heads, who educated more, are better in solid waste management than the uneducated ones. According to the result, except 1.56% (illiterate), all of households who manage waste effectively are highly educated. This is because when household head improve his/her existing educational level that would be a grant to raise level of understanding and mind maturity. Besides, female headed households are better in solid waste management than male headed households. It implies that, as governed by tradition and having relatively better experience, full of inside house activities (such as childcare, shopping, cooking, cleaning and wellbeing of their husbands) are left for females.

However, even though males are highly educated than females in the town, the result shows that females are better in waste management than males. Due to this, it seems contradictory, but not. It means that households who manage their wastes effectively and highly educated are smaller than the ineffective management group one. Similarly, most of the households who experienced in effective management are covered by female headed. Because of this, those household heads who fulfill both of effective waste management and high educational level at the same time are females though they are small in number. Thus, there is a need to deliver solid waste related education for female than males in order to improve the disposal system of the town.

Socio-cultural factors have a significant impact on households to manage their solid wastes effectively or ineffectively. Location (distance of residential house from the main road) is significant at 5% level with negative sign. This is because, since the municipality did not assign waste container in different parts of the town and also private waste collectors do not have adequate facilities that help to serve each household equally, households who are living far from the center are encouraged to dispose their wastes in unauthorized sites (manage ineffectively). In addition, the locations or villages that are far from the center of the town by itself invite the households to dispose in unauthorized place.

Households' awareness or understanding about solid wastes and its management is significant with positive sign at 1% significant level. The larger proportions of households (46.5%) believe that solid wastes are totally useless. Besides, because of lack of understanding, not visualizing the importance of waste separation and assuming as municipality's responsibility, significant number of respondents (81.5%) did not apply solid waste separation at sources.

About 70% of the respondents replied as they got solid waste management related information or orientation from different sources other than municipality (i.e. from health extension staff, at kebelle meeting and different posters). However, like logistic regression, chi-square result also shows that the effectiveness of solid wastes management at household level is influenced by the understanding level of households in the town. It implies that households who disposed off wastes in unauthorized site have less understanding level than the one who manage wastes effectively. This is because the households did not get relevant information that can improve their understanding and motivation. In other words, both the health extension staff and 'kebelle' administrators did not provide information to the households, particularly about the values of effective waste management and the negative consequence of improper disposal of wastes; rather they simply provide commands (informing directions) on how to dispose solid wastes from their home. If this is so, the households may not be initiated to do as per orientation through internalizing the issues because of lack of understanding about the consequences of improper disposal.

Almost all the respondents are very interested to manage their wastes effectively if they have an access to different solid waste disposal facilities. However, the variable of willingness to pay shows a significant effect on the effectiveness of solid wastes management in the study area. It is due to low level of awareness about solid wastes and its management. Because, the main reasons, among others, stated by most of respondents for not being a user of private waste collectors were the availability of enough space in back yard and their home is near to river. It emanates from lack of awareness but not because of unwillingness to use the collection services.

Institutional factors: facilities (equipments), budget, manpower, law of enforcement and accessibility of private solid waste collectors have a profound impact on the effectiveness of household solid waste management at source. Even, according to the study result, institutional

factors are a base (causes) to the other determining factors. The interpretation of the accessibility of private participants is that, households who have an access of private waste collectors are better in solid waste management than who do not have. This is because, as a rational being, since there is no container at all in the town and the municipality's vehicle is not functional, those households who do not have an access of private waste collectors, even though they properly stored on temporary material, still forced to dispose off their wastes in unauthorized sites.

The staff members of solid waste management activity in Ambo did not have technical skill that help them to operate the given task and also did not get at least short term training on this specific issue. Besides, large proportions of the municipality budget are assigned to other city's basic development than solid waste related activities. Due to this, the necessary facilities, especially container and adequate vehicle services including waste gown and glove for private waste collectors, are not provided by municipality. Thus, the private waste collectors do not have adequate capacity to serve all households of the town. But the households confirmed that the private participants have adequate skill and commitment in order to perform their given responsibility with fair payment.

Moreover, even though solid waste related law and regulation was designed with the detail procedures of application at regional level since 1993 E.C, its enforceability is shown as one determinant factor for the poor performance of the town's waste management. Most of the households responded as they do not know whether the regulation is existed. This is because, since the municipality head did not seriously follow up the real performance of the solid waste related sector, assign sufficient budget and adjust training for staff to improve their skills and understanding by taking as main sector of the town, the responsible employees may not be motivated or encouraged to do more with a good moral.

5.2 RECOMMENDATIONS

Based on the findings of the study, the researcher forwarded the following recommendations.

The finding shows that most of highly educated females in the area are experienced in proper management and give care for cleaning of the house and immediate surrounding area (village). Therefore, extensive environmental education should be given for females in order to improve their level of understanding and initiation to do more. Of course, the town's health extension bureau already began to train regularly a limited number of women about their environmental related packages including solid waste management but it should be strengthened through outreach methods.

In relation to the above recommendation, the issue of households' awareness has to be considered in order to develop a good management system. As discussed earlier, even though most of households have got solid waste related information from health extension experts via door to door educational service, till lack of awareness and/or perception is the main cause for the poor performance of household solid waste management in the town. Therefore, to solve this problem the responsible body should change ways/means of awareness creation. To make the recommendation specific; instead of only providing commands or showing the way how to properly dispose wastes, it is also better to build households' awareness through educating the relationship between solid waste management and environment. In other words, the municipality should inform households, specifically, about the value of effective management and the negative consequences of dumping wastes in unauthorized sites. Thus, the households can easily internalize the issue why solid wastes should be managed in a proper manner and then improve their initiation to participate on the management of solid wastes. This is because persistence education and awareness creation raising initiatives to do more. In addition to this, the households should be informed about the reduction of waste generation at source. Hence, due to the building of awareness campaign, with no question the households' attitude and willingness to pay for waste collection services would be developed.

The result of this study reported that illegal dumping is highly practiced in Ambo. Besides, the law enforceability shows a significant impact on effective solid waste management at household level. It means that the law enforcement section of the local government gives little attention to

the solid waste regulation. Thus, for laws to be effective people need to know the presence of laws and should penalize the households who violate the regulation. To do this, the municipality or local government should give emphasis to this issue and assign honest and self-reliant person in order to run the activity on the base of transparency and accountability. And then the direct responsible body should follow up the performance of solid waste management sector.

Due to financial problem, the municipality faced lack of solid waste collection facilities such as container, adequate vehicle service, waste gown, glove, and adequate carts. Therefore, to solve this main problem the municipality should do the following: first, instead of giving a prior emphasis to the other city's developmental sectors, it is better to assign adequate annual budget to the sector by considering like other main sectors that assure the development of the town. Second, like what has been done by ex-officials of the municipality (example, push carts were donated by WHO), it should find out NGOs, government agencies, or others that can participate on solid waste management services, as possible. If this so, at least containers can be placed in some parts of the town (particularly the place where far from the main road, which is not easily served by the private participants), improve inadequacy of vehicle service and some of important facilities also provide to private waste collectors. Thus, the door to door collectors will be encouraged to do the given assignment with close relation to municipality and will improve the effectiveness of solid waste management at household level.

Besides, the study reported that the municipality does not have employees, who are specialized on environment related issue and even who took short term training; rather all staff are doing their responsibility through experience. Hence, these staff members were not initiated (motivated) to do their assignment effectively and build the awareness of households on solid waste management. Thus, by avoiding inadequate emphasis towards this sector, the municipality responsible body should improve first the awareness of the staff through training. To do this, the municipality should create cooperation network with Ambo University, particularly environmental science department, then it can improve the staff potential and skill with low cost. But it requires initiation. Hence, since the employees would have expertise on the issue, they could create other means of waste management that consider the situation of the town and/or easily follow up the performance of private collectors' service.

To solve the problem of access to private waste collectors' services the municipality should encourage the private sectors (organize additional jobless youths) to involve or participate in solid waste management of the town. In addition, since the households indicated as they are willing to pay if they can get regular service; the only thing that expected from the municipality is simply coordinating and/or motivating the households to use the service. Hence, if the municipality has close relation with private participants and encourages them through different incentives, training or cooperation, they could serve all of the households equally. Thus, it will increase the number of households who serve per day and the waste will be disposed off before it creates health problem and environmental pollution. However, arrangement with private sectors has not all been successful; rather the ability of municipal administration to write and enforce an effective contract including the components of competition, transparency, and accountability on private sectors side are determined the success of private participants on waste collection services. Therefore, the municipality should consider these issues when rearrange the formation of door to door waste collectors and should follow actively how they are serving the households and secure the town's aesthetics or environmental health. Even it is very much interesting if the municipality by itself collects service charges (fees) from each user through, either along with tax or directly on the form of waste collection services payment, and paid to the private participants depending on their agreement. If this is so, the follow up of waste collectors' performance by the municipal would be easy.

The effectiveness of household solid waste management can be ensured when community based organizations (CBOs) take active parts in the services. CBOs can support the municipality in different parts such as build public awareness, financial support, mobilizing the community in general to participate in the services and providing any necessary facilities to waste collectors. Therefore, if CBOs (either established by Age, Gender and Occupation like women's associations, farmers associations and youth associations or traditionally established like 'Idir', and 'Ekub') can be involved in the town's waste management services, its effectiveness will ensure with in short period of time. To use this approach, the municipality should assess the existence of the felt need and the social acceptance of the approach; the willingness of the local government; the accountability of CBOs leaders, and to what extent they are transparent. Finally, the municipality should give orientation to all stakeholders (such as households, private participants, CBOs, local governments and the like) and then launch the system.

References

Aklilu, A. (2002) ***Households' Willingness to Pay for Improved Solid Waste Management: The Case of Addis Ababa.*** A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Alebel, B. and **Dawit**, W. (2003) ***Integrated Solid Waste Management in Addis Ababa:*** Presented on "Local Economic Development and Globalization" conference organized by Addis Ababa University and Institute of Social Study (ISS) at Ghion Hotel, Addis Ababa - Ethiopia.

Ali, S. M. (2001) ***Assessment of Solid Waste Management Practices of Households****: A Case Study of Two Selected Coastal Barangays of Catanauan Municipality, Quezon Province, Philippines. Available at:* www.upd.edu.ph/~surp/about_surp/2001-**ali**.pdf. (Accessed date: 15 December 2010)

Bizatu, M. and Negga, B. (2010*)* ***Community based assessment on household management of waste and hygiene practices in Kersa Woreda, Eastern Ethiopia*****.** College of Health Sciences, Haramaya University, Harar, Ethiopia. *Ethiop. J. Health Dev.* 2010: 24 (2):103-109

CED (2003) ***Study of the Attitude and Perception of Community towards Solid Waste Management: A Case Study of Thiruvananthapuram City – Phase II.*** A project Submitted to Kerala Research Program on Local Level Development, Centre for Development Studies, Thiruvananthapuram.

ENPHO (2007) ***Solid waste management in Nepal***. 110/25 Adarsa Marga-1, Thapagaon, New Baneshwor GPO Box: 4102, Kathmandu, Nepal. Available at www.enpho.org. (Accessed date: 25 January 2011)

Federal democratic republic of Ethiopia (2007) solid waste management proclamation. Proclamation No. 513/2007, ***Negarit Gazita,*** 13th year No. 13, Addis Ababa 12th February 2007. Available at: http://www.eepco.gov.et (accessed date: 15 march 2011)

G/ TSADKAN, G. (2002) ***Domestic Solid Waste Management in Mekelle City: Tigray Region.*** A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Gebrie, K. (2009) ***Management of Domestic Solid Waste in Ethiopia: Operational Analysis and Assessment of Constraints in Bahir Dar Town, the Capital of Amhara National Regional State, Ethiopia.*** Available at: http://www.amazon.com (Accessed date: 21 may 2011)

ILO (2007) ***Start Your Waste Recycling Business: A Technical Step-By-Step-Guide of How to Start a Community-Based Waste Recycling Business.*** Norfolk Rd, Mt Pleasant Arundel Office Park PO Box 210 Harare, Zimbabwe

Jenkins, R. R. Martinez, S. A Palmer, K. and Podolsky, M. J. (2000) ***the Determinants of Household Recycling: A Material Specific Analysis of Recycling Program Features and Unit Pricing.*** Discussion Paper 99-41-REV, Washington, D.C. Available at: Internet: http://www.rff.org (Accessed date: 15 may 2011).

Kamar, A. J. (2006) Household participation in domestic waste disposal and recycling in the Tshwane Metropolitan area: an environmental education percpective. A master's thesis presented to the department of environmental education, at the University of South Africa.

Kaseva, M. E. and Mbuligwe, S. E. (2003) ***Appraisal of solid waste collection following private sector involvement in Dares Salaam city, Tanzania***. Department of Environmental Engineering, Faculty of Lands and Environmental Engineering, University College of Lands and Architectural Studies (UCLAS). Available at: http://www.sciencedirect.com (Accessed date: 18 may 2011).

Lemma, A. (2007) ***Household Solid Waste Generation Rate and Composition Analysis: the case in two Selected Kebeles of Adama Town.*** A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Longe, E. O. Longe, O. O. Ukpebor, E. F. (2009) **People's Perception On Household Solid Waste Management In Ojo Local Government Area In Nigeria.** Iran. J. Environ. Health. Sci. Eng., 2009, Vol. 6, No. 3, pp. 209-216. Available at: http://journals.tums.ac.ir (Accessed date: 16 may 2011)

Melaku, T. (2008) ***Household Solid Waste Generation Rate and Physical Composition Analysis, In Jimma Town Ethiopia.*** A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Memon, A.M. (2002) ***Solid Waste Management in Dhaka: Innovation in Community driven Composting, Bangladesh.*** Available at: http://kitakyushu.iges.or.jp (Accessed date: 01 may 2011)

Net industries (2010) ***waste management: municipal solid waste management***. Available at: http://science.jrank.org/pages/7289/Waste-Management-Municipal-solid-waste.html (Accessed date: 28 December 2010).

Post, J. L. (2007) ***Solid Waste Management in Jamaica: An Investigation into Waste Reduction Strategies.*** A Thesis presented to the Master of Science in Civil Engineering, Michigan Technological University, Jamaica.

Poswa, T. T. (2004) ***the Importance of Gender in Waste Management Planning: A Challenge for Solid Waste Managers.*** Durban Institute of Technology (DIT) (former Technikon Natal), Department of Environmental Health, P.O. Box 953, Durban, 4000, South Africa. Available at: http://kharahais.gov.za (Accessed date: 12 may 2011)

Prakriti (2007) ***Solid Waste Management: Principles and Terminologies*****.** Centre for Management Studies, Dibrugarh University as part of the National Environment Awareness Campaign; available at http://cmsdu.org. (Accessed date: 25 January 2011)

Puopiel, F. (2010) ***Solid Waste Management in Ghana: The Case of Tamale Metropolitan Area.*** A master's thesis presented for the department of development policy and planning, Kwame Nkrumah University of Science and Technology. Available at: http://dspace.knust.edu.gh (Accessed date: 10 may 2011)

Rahman, M. Bahar, M. Uddin, N. Islam, A. and Harun, A.Y. (2005) ***People's Perception of the Existing Solid Waste Management of Khulna City Corporation (KCC) Area: A Case Study of Participatory Management.*** A paper presented in: National Workshop for REGA and CDM Awareness Building & Motivation under the ADB PREGA Project in the Western Inn. Ltd., Khulna Bangladesh on 03-04 July, 2005, organized by Bangladesh Centre for Advanced Studies

Rouse, J. (2008) ***planning for sustainable municipal solid waste management***: Practical Action; the Schumacher Centre for Technology and Development Bourton-on-Dunsmore Rugby, Warwickshire, CV23 9QZ. United Kingdom. http://www.practicalaction.org. (Accessed date: 23 January 2011)

Schübeler, p. (1996) ***Urban Management and Infrastructure: conceptual framework for municipal solid waste management in low-income countries***. UNDP/UNCHS/World Bank/SDC Collaborative Program on Municipal Solid Waste management in Low-Income Countries. Working paper No. 9. Available at: http://www.worldbank.org (Accessed date: 18 may 2011)

SMSWG (2008) ***Global waste challenges***: Situation in Developing Countries**;** Department of water and sanitation in developing countries at EAWAG, conducted under the support of Swiss Federal Institute of Aquatic Science and Technology. Available at: http://www.novaquatis.eawag.ch/organisation/abteilungen/sandec/schwerpunkte/swm/index EN (Accessed date: 10 December 2010)

Smith S.E. (2003) ***what is solid waste management.*** Available at: http://www.wisegeek.com/what- is-solid-waste-management.htm . (Accessed date: 02 Jan 2011)

Solomon, A. (2006) ***Solid Waste Management: A Case Study of Household Solid Waste Management in Arada Sub-City, Addis Ababa.*** A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Sterner, T. and Bartelings, H. (1999) ***Household Waste Management in a Swedish Municipality: Determinants of Waste Disposal, Recycling and Composting.*** Environmental and Resource Economics; Department of Economics, University of Göteborg, Vasagatan 1, Gothenburg, Sweden

Tewodros, T. (2006) ***Household Behavior and Solid Waste Management Survey Evidence from mekelle, Ethiopia.*** A Master's Thesis presented to Environmental Economics and Natural Resources Group, Wageningen University.

UNESC (2009) ***Africa Review Report on Waste Management.*** Committee on Food Security and Sustainable Development Regional Implementation Meeting for CSD- 18 Sixth Session 27-30 October 2009 Addis Ababa, Ethiopia

USAID (2004***) How to Develop an Effective Solid Waste Collection Program***: ***A Primer for Solid Waste Collection in Manado, North Sulawesi, Indonesia.*** January 2004. Research Triangle Institute (USA) in association with PT Deserco Development Services. Available at http://pdf.usaid.gov/pdf_docs/PNACY593.pdf (Accessed date: 18 may 2011)

William, G. S. (2002) ***Solid Waste Management in Kawempe Division: Issues, Challenges and Emerging Options.*** Makerere, Faculty of Forestry & Nature Conservation, Kampala.

World Bank (2000***) Community Based Pilot Project on Solid Waste Management in Khulna City: General Project Description.*** Water and Sanitation Program – South Asia, World Bank Office, Dhaka 3A Paribag, Dhaka 1000: Bangladesh. Available at: www.wsp.org . (Accessed date: 21 January 2011)

Woroniuk, B. and Schalkwyk, J. (1998) land and environment: waste disposal by gender difference. Prepared for sida, November 1998, Stockholm, Sweden. Available at: http://www.oecd.org (Accessed date: 20 may 2011)

Yesuf, M. A. (2009) ***Introduction to STATA***. Teaching material, department of Economics, college of business and economics, Mekelle University, Mekelle, Ethiopia.

Zahur**,** M. (2007) ***Solid Waste Management of Dhaka City: Public Private Community Partnership.*** BRAC University Journal, Vol. IV, No. 2, 2007, pp. 93-97, *Department of Mathematics and Natural Sciences BRAC University, 66 Mohakhali Dhaka-1212, Bangladesh* Available at**:** http://dspace.bracu.ac.bd (Accessed date 20mmay 2011)

Zhu, D. Asnani, U. P. Zurbrügg, C. Anapolsky, s. and Mani, s. (2008) Improving municipal solid waste management in India: A sourcebook for policy makers and practitioners. Available at http://www.infibeam.com (Accessed date: 18 may 2011)

Zurbrügg, C. (2003) ***Urban Solid Waste Management in Low-Income Countries of Asia: How to Cope with the Garbage Crisis.*** Presented for: Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session, Durban, South Africa, November 2002

Zurbrügg, C. and Ahmed, R. (1999) ***Enhancing Community Motivation and Participation in Solid Waste Management.*** SANDEC Report No. 4; 1999, SANDEC/ EAWAG Duebendorf, Switzerland. Available at: http://www.bvsde.paho.org (Accessed date: 15 April 2011)

Zurbrügg, C. and Schertenleib, R. (1998) ***Main problems and issues of municipal solid waste management in developing countries: with emphasis on problems related to disposal by landfill***. Presented at the third Swedish landfill research symposia, October 1998 Lulea, Sweden

Appendices

Appendix 1**: Summery of descriptive statistics (continuous variables)**

	Full sample		Effective management		Ineffective management		
Variables	**Mean**	**std.dev**	**Mean**	**std.dev**	**Mean**	**std.dev**	**t-test**
HHage	41.5	10.548	37.375	8.243	43.441	10.975	**3.9290***
Incmon	1943.16	1250.31	2616.59	1322.531	1626.257	1082.589	**-5.6112***
Ystay	22.19	11.4129	22.468	11.011	22.059	11.635	**-0.2364**
Fsize	4.85	1.6827	4.6406	1.674905	4.948529	1.683558	**1.2085**

NB: * significant at 1% level

Appendix 2: Summery of descriptive statistics (discrete variables)

		Effective management		Ineffective management		
Variables		**Freq.**	**Prec.**	**Freq.**	**Perc.**	Chi2-test
HHsex	Male	31	48.44	100	73.53	**12.1254***
	Female	33	51.56	36	26.47	
HHedu	Illiterate	1	1.56	5	3.68	**23.3162***
	Elementary	0	0	16	11.764	
	Junior	3	4.69	10	7.35	
	High school	9	14.06	37	27.21	
	Diploma	20	31.25	36	26.47	
	Degree	29	45.31	26	19.12	
	Masters	2	3.125	6	4.41	
Dist	>200	33	51.56	40	29.41	**10.1618***
	200-500	22	34.38	58	42.65	
	>500	9	14.06	38	27.94	
Lawenforce	None at all	16	25	100	73.53	**83.5465***
	Regulation is weak	17	26.56	36	26.47	
	Regulation is strong	31	48.48	0		
MSEaccess	None at all	0	0	99	72.79	**94.6635***
	Note enough	43	67.19	30	22.06	
	Enough access	21	32.81	7	5.15	
Aware	YES	61	95.31	79	58.09	**28.7159***
	NO	3	4.69	57	41.91	
Willin_pay	YES	63	98.44	99	72.79	**18.5952***
	NO	1	1.56	37	27.21	

Appendix 3: Household head's educational status

Educational level	Male	Female	Total
Illiterate	2 (25%)	6 (75%)	8(4%)
elementary	10 (62.5)	6 (37.5)	16 (8%)
junior	4 (40%)	6 (60%)	10(5%)
high school	31 (68.9%)	14 (31.1%)|	45(22.5%)
Diploma	28 (53.8)	24(46.2)	52(26%)
Degree	49 (80.3%)	12(19.7%)	61(30.5%)
Masters	8 (100%)	0(0%)	8(4%)
Total	132	68	200 (100%)

Source, household survey 2011

Appendix 4: Manpower of the solid waste management in Ambo town by duty and specialization

Code	Sex			Responsibility	Condition of employment		Qualification		
	M	F	T		Permanent	Temporary	Level of Education	Specialization	Training, if any
1	✓		1	Head of the sector	✓		BA degree	Development management	5 days workshop
2	✓		1	Greenery facilitator	✓		BA degree	Development management	-
3	✓		1	Water pipe	✓		diploma	Automotive	-
4	✓		1	Assistant	✓		certificate	TVET	-
5	✓		1	Assistant	✓		certificate	TVET	-
6		✓	1	Sewerages sanitation	✓		certificate	Health extension	-
7	✓		2	Solid waste loaders (like day workers)		✓	elementary	-	-

Source: survey result 2011

Appendix 5: Door to door solid wastes collectors in Ambo while collecting wastes in the morning

Source: survey photo 2011

Appendix 6: Logit result without robust

					Number of obs	= 200
					LR chi2(9)	= 156.69
					Prob > chi2	= 0.0000
Log likelihood = -47.030738					Pseudo R2	= 0.6249

effective	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
HHage	-.0286906	.0362018	-0.79	0.428	-.0996448	.0422636
HHsex	1.550173	.6697477	2.31	0.021	.2374912	2.862854
ystay	.0263143	.0296368	0.89	0.375	-.0317728	.0844013
dist	-.7777995	.3657412	-2.13	0.033	-1.494639	-.0609599
MSEaccess	2.925079	.5589894	5.23	0.000	1.82948	4.020678
aware	2.737126	.7751605	3.53	0.000	1.217839	4.256412
willin_pay	4.709258	1.655084	2.85	0.004	1.465352	7.953164
educ	.1009161	.0374558	2.69	0.007	.0275041	.1743282
fmsize	1.176976	.7423105	1.59	0.113	-.2779263	2.631877
_cons	-12.48815	3.285207	-3.80	0.000	-18.92703	-6.049259

Appendix 7: Logit result with robust standard error

					Number of obs	= 200
					Wald chi2(9)	= 55.58
					Prob > chi2	= 0.0000
Log pseudolikelihood = -47.030738					Pseudo R2	= 0.6249

effective	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
HHage	-.0286906	.0450571	-0.64	0.524	-.117001	.0596198
HHsex	1.550173	.6536004	2.37	0.018	.2691393	2.831206
ystay	.0263143	.0322329	0.82	0.414	-.036861	.0894895
dist	-.7777995	.3406312	-2.28	0.022	-1.445424	-.1101745
MSEaccess	2.925079	.5793605	5.05	0.000	1.789553	4.060605
aware	2.737126	.8108659	3.38	0.001	1.147858	4.326394
willin_pay	4.709258	1.951097	2.41	0.016	.8851788	8.533337
educ	.1009161	.0353143	2.86	0.004	.0317014	.1701308
fmsize	1.176976	.8995166	1.31	0.191	-.5860446	2.939996
_cons	-12.48815	3.436594	-3.63	0.000	-19.22375	-5.752546

Appendix 8: Logit result with robust and odds ratio

Number of obs = 200
Wald chi2 (9) = 55.58
Prob > chi2 = 0.0000
Log pseudo likelihood = -47.030738 Pseudo R2 = 0.6249

effective	Odds Ratio	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
HHage	.9717171	.0437828	-0.64	0.524	.8895843	1.061433
HHsex	4.712284	3.079951	2.37	0.018	1.308837	16.96591
ystay	1.026664	.0330923	0.82	0.414	.9638101	1.093616
dist	.4594158	.1564914	-2.28	0.022	.235646	.8956778
MSEaccess	18.6357	10.79679	5.05	0.000	5.986779	58.00939
aware	15.44253	12.52182	3.38	0.001	3.151434	75.6709
willin_pay	110.9698	216.5128	2.41	0.016	2.423418	5081.375
educ	1.106184	.0390641	2.86	0.004	1.032209	1.18546
fmsize	3.244546	2.918523	1.31	0.191	.5565242	18.91577

Appendix 9: mfx (Marginal effect)

Marginal effects after logit
y = Pr(effective) (predict)
= .09009729

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
HHage	-.002352	.00315	-0.75	0.455	-.008526	.003822	41.5
HHsex*	.1598328	.08891	1.80	0.072	-.014436	.334102	.345
ystay	.0021572	.00255	0.85	0.398	-.002845	.00716	22.19
dist	-.0637638	.03578	-1.78	0.075	-.133885	.006357	1.87
MSEacc~s	.2397973	.07578	3.16	0.002	.091274	.388321	.645
aware*	.1693594	.06183	2.74	0.006	.04817	.290549	.7
willin~y*	.1928457	.05292	3.64	0.000	.089121	.296571	.81
educ	.0082731	.0036	2.30	0.022	.001216	.01533	15.205
fmsize	.0964882	.06816	1.42	0.157	-.03711	.230087	2.16702

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 10: Test of Multicollinearity

	effect~e	HHage	HHsex	educ	ystay	fmsize	incmon	dist	MSEacc~s	aware	willin~y
effective	1.0000										
HHage	-0.2689	1.0000									
HHsex	0.2462	-0.2114	1.0000								
educ	0.2771	-0.2381	-0.2171	1.0000							
ystay	0.0168	0.4792	0.0572	-0.2643	1.0000						
fmsize	-0.0831	0.3488	-0.2909	-0.0074	0.0518	1.0000					
incmon	0.3704	-0.1508	-0.0216	0.5818	-0.1177	0.0631	1.0000				
dist	-0.2201	0.2060	-0.1657	-0.0862	0.0632	0.1825	-0.1046	1.0000			
MSEaccess	0.6569	-0.2062	0.2137	0.1672	0.0619	-0.0904	0.2336	-0.1031	1.0000		
aware	0.3789	-0.3132	0.1079	0.0718	-0.1204	-0.2043	0.0333	-0.0543	0.2401	1.000	
willin_pay	0.3049	-0.0812	-0.0239	0.3099	-0.0770	0.0166	0.2793	0.0177	0.2235	0.0445	1.000

Appendix 11: Normality test result (household education and family size)

I. HHedu (household head educational level)

Transformation	formula	chi2(2)	P(chi2)
cubic	HHedu^3	14.54	0.001
square	**HHedu^2**	**8.71**	**0.013**
identity	HHedu	12.88	0.002
square root	sqrt(HHedu)	63.20	0.000
log	log(HHedu)	.	.
1/(square root)	1/sqrt(HHedu)	.	.
inverse	1/HHedu	.	.
1/square	1/(HHedu^2)	.	.
1/cubic	1/(HHedu^3)	.	.

II. fsize (family size)

Transformation	formula	chi2(2)	P(chi2)
cubic	fsize^3	.	0.000
square	fsize^2	48.36	0.000
identity	fsize	5.38	0.068
square root	**sqrt(fsize)**	**3.48**	**0.176**
log	log(fsize)	30.96	0.000
1/(square root)	1/sqrt(fsize)	.	0.000
inverse	1/fsize	.	0.000
1/square	1/(fsize^2)	.	0.000
1/cubic	1/(fsize^3)	.	0.000

Appendix 12: The extent of door to door solid wastes collectors discharges their responsibility.

S. No	Items to measure private solid waste collector's services	Household's Response			
		YES		NO	
		Freq	%	Freq	%
1	Equal treatment to all households	44	68.75	20	31.25
2	They have Adequate skill	38	59.38	26	40.63
3	They have Adequate capacity	22	34.375	42	65.625
4	The Payment of their service is fair	42	65.625	22	34.375
5	They collect wastes at the right and needed time	46	71.88	18	28.13
6	Generally, They are committed in providing their services	47	73.44	17	26.56

Source: survey result 2011

Appendix 13: QUESTIONNAIRE PREPARED FOR SAMPLE HOUSEHOLDS

INTRODUCTION

Deer respondents, this is Ashenafi Haile. I would like to inform you that this questionnaire is prepared for academic purpose only; that is, I am conducting a research, which is entitled on **"DETERMINANTS OF EFFECTIVE HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICE",** for the fulfillment of MA Degree in Development Studies; Mekelle University, Ethiopia.

Besides, the outcomes of this research will help the efforts made by the responsible bodies or individuals to resolve or mitigate the problems of solid waste management in the city.

Thus, respondents by understanding the importance of this research work, I kindly request you to fill this questionnaire honestly without any hesitation. Thank you in advance for your cooperation!!!!

N.B.

1. This questionnaire is to be filled by household head / the wife can substitute her husband/
2. You are not required to write your name
3. You are kindly asked to read carefully and respond to each and every questions included within the questionnaire
4. You are required to return back the questionnaire, after you completed, to its administrator soon, preferably within 2 days.
5. Please put a **"✓"** mark in the box of your choice.

Code: _____

Name of enumerator:_____

Name of supervisor:_____

Kebelle (Got):_____

I. DEMOGRAPHIC CHARACTERISTICS

1. Age of the household head: _____
2. Sex of the household head is (0) male ☐ (1) female ☐
3. Educational status of household head is: _____
4. How long have you stayed here in the city of Ambo? _____year (s)
5. Could you please tell me your household's monthly income? _____birr/month
6. could you please tell me the size of your household including yourself_____ (number of family members)
7. What is the distance to the main road from your house _____ meter (s)

II. CURRENT SITUATION OF HOUSEHOLD SOLID WASTE MANAGEMENT

8. What are the major solid wastes that your household averagely generates per month? (**Rank** them in terms of higher proportion in volume of all of the wastes)

	(1)	(2)	(3)	(4)	(5)
Ash	☐	☐	☐	☐	☐
Food wastes	☐	☐	☐	☐	☐
Wood	☐	☐	☐	☐	☐
Grasses and leaves	☐	☐	☐	☐	☐
Paper	☐	☐	☐	☐	☐
Bones	☐	☐	☐	☐	☐
Metals	☐	☐	☐	☐	☐
Plastics/ textile	☐	☐	☐	☐	☐

Other, please specify

_____

9. Do you have a temporary solid waste storage in your house?

(1) YES ☐ (0) NO ☐

If No, go to question 12

10. What kind of storage do you use?

1. Basket ☐ (3) plastic bags ☐
2. Sack ☐ (4) write, if any _____

11. If No, how can you store solid wastes or how you come across with the problem of solid waste storage?_____

_____

12. Is solid waste disposing container available in your neighborhood?

(1) YES ☐ (0) NO ☐

14. If your answer for question No. 13 is "NO", what other means do you use to dispose off the solid wastes of your household?

(1) Throw it on an open space, in sewerage or on street ☐
(2) Digging a hole around the house and burn it ☐
(3) Disposing on the backyards of the house ☐

(4) Throw it in to the nearby rivers ☐

(5) Private collectors take it ☐

(6) Others, please specify_____

15. Have you ever seen solid wastes from residential houses thrown away (dumping) on streets, in sewerages or in nearby rivers?

(1) YES ☐ (0) NO ☐

16. If your answer for question No. 15 is "YES", how frequent do you come across these solid wastes thrown away illegally?

(1) Always ☐ (3) Some times ☐

(2) So many times ☐ (4) rarely ☐

17. How frequently do you usually dispose your wastes to either of your choice dumping place?

(1) Every day ☐ (4) Every week ☐ (7) Once a month ☐

(2) Every 2 to 3 days ☐ (5) Every two weeks ☐ (8) if any other: _____

(3) Every 4 to 5 days ☐ (6) Every three weeks ☐

18. What time do you prefer to dispose your household wastes?

(1) Early morning ☐ (3) noon ☐ (5) early night ☐

(2) Late morning ☐ (4) afternoon ☐ (6) the time of private waste collectors ☐

19. Is there any micro and small enterprises that collect solid wastes via door to door system in your kebele?

(1) YES ☐ (2) NO ☐

If NO, go to question 25 and 26

20. How long have you been getting the service?

(1) For one year ☐ (3) For 3 years and above ☐

(2) For 2 years ☐ (4) indicate if any other _____

21. How often do the MSEs collect solid wastes from your house?

(1) Weekly ☐ (2) monthly ☐

(3) Twice a month ☐ (4) please indicate if any other _____

22. How much do you pay for the MSEs Services, indicate in birr? _____

23. Do you believe that the service rendering by the enterprise is satisfactory?

(1) YES ☐ (2) NO ☐

24. If your answer for question number 24 is "NO", what do you think the problem behind?

_____

25. If you are not getting the MSEs services, do you believe that the location of your home/ village/ is one factor to prevent you from such services?

(1) YES ☐ (2) NO ☐

26. What do you think the main reasons why you did not get the MSEs waste collection services?

_____

27. What do you do with the solid waste from your household if the MSEs or the municipality truck did not come at the right time and find your temporary storage full?

(1) I keep the waste at home until the collectors are coming by using other storage materials ☐

(2) I burn it in the back of my home ☐

(3) I dump it on open space, which is far from the main road ☐

(4) I dump it in sewerage ☐

(5) Indicate if any other alternatives _____

28. To what extent the MSEs discharge their responsibility?

S. No	MSEs	YES	NO
28.1	Treating all households equally		
28.2	Have adequate capacity to serve the given place/ household		
28.3	Have required skill to collect and manage household wastes effectively		
28.4	Collect wastes from households at the right / needed time		
28.5	The payment they receive from household is fair		
28.6	Generally, they are committed in providing their services		

III. AWARENESS AND ATTITUDE TOWARDS SOLID WASTE MANAGEMENT

29. What do you think of solid wastes? Do you think solid wastes are?

(1) Useless ☐ (3) useful ☐

(2) Somewhat useful ☐

30. Do you agree with the importance of solid waste management?

(1) YES ☐ (2) NO ☐

31. Does your household practice waste separation?

(1) YES ☐ (2) NO ☐

32.If YES, how do you separate it? _____

33. If NO, what do you think the reason behind?

(1) I do not have the understanding about waste separati ☐

(2) I did not think as it is my responsibility ☐

(3) I did not visualize the importance of separation ☐

(4) if any other reason, please specify it _____

34. Do you know that your solid waste generation is affected by or related to your consumption pattern?

(1) YES ☐ (2) NO ☐

35. Who do you think is responsible for solid waste management?

(1) The municipality ☐ (5) The municipality and the private waste collectors ☐

(2) The private waste collectors ☐ (6) municipality and household ☐

(3) The households ☐ (7) All of the above bodies are responsible ☐

(4) The household and the private waste collectors ☐

36. How do you evaluate the efforts of made so far by the municipality of the city to provide solid waste management services

(1) Very good ☐ (3) fair ☐ (5) very poor ☐

(2) Good ☐ (4) poor ☐

37. Which of the following do you think is the best institute to handle solid waste management in Ambo town?

(1) The municipality ☐ (3) if any other institution, please specify _____

(2) Private enterprises ☐

38. What are your major justification to choose any of the above institute (question number 37)?_____

39. What do you think is the current number of private wastes collectors (MSEs)? Do you have enough access to them?

(0) none at all ☐ (1) not enough access ☐ (2) enough access ☐

40. Do you know that there are rules and regulations of solid wastes in Ambo city?

(1) YES ☐ (2) NO ☐

41. How do you evaluate the follow – up by the responsible bodies to practice the rules and regulations of solid waste disposal in Ambo?

(0) none at all ☐ (1) regulation is weak ☐ (2) regulation is strong ☐

42. Have you ever seen when violators of regulation in solid waste management are penalized?

(1) YES ☐ (2) NO ☐

43. If your answer for question No. 42 is "yes", how do you evaluate the appropriateness of the penalty to prevent violators of solid waste management rules and regulations?

(1) Very strong ☐ (3) fair ☐ (5) very week ☐

(2) Strong ☐ (4) weak ☐

44. Have you ever come across any form of lesson associated with solid waste management?

(1) YES ☐ (2) NO ☐

45. If your answer for question No. 44 is "YES", through what methods (means) did you get it?

(1) In kebele meeting ☐ (3) in poster and photograph ☐

(2) In health institution ☐ (4) if any other _____

46. Have you ever taken any information/lesson/ regarding to solid wastes from the town municipality?

(1) YES ☐ (2) NO ☐

If YES, answer question 47 and 48

47. In what way did you get solid waste related information from your town municipality?

(1) In general meeting of the town ☐ (3) in Idir meeting ☐

(2) In kebele meeting ☐ (4) if any other_____

48. Specifically, the given information concentrated on: ***(you can tick more than one)***

(1) The impact of solid waste on environment ☐

(2) The importance of appropriate solid waste management ☐

(3) The disease because of inappropriate waste disposal ☐

(4) The way to manage household solid wastes effectively ☐

(5) Any other_____

49. Have you ever provide any complain to the municipality when the private waste collectors or the municipality truck did not come in your household at the right time?

(1) Yes ☐ (2) No ☐

50. If your answer for question number 50 is "NO", what action did you take to solve such problem? _____

51. Are you willing to pay for the private waste collectors' service in order to improve solid waste disposal practice in your town?

(1) YES ☐ (2) NO ☐

52. **Based on the following information, evaluate the municipality service with the evidence of its collection / management system:**

S.No.	**Do you observe disparity in service provision between:**	**YES**	**NO**	**If YES, which areas are better served**	
52.1	Lower income and higher income residents			Lower income ☐	Higher income ☐
52. 2	The area at or near the main road (the center of the city) and the area far from the center of the city (main road)			Near to main road/center of the city ☐	Far from main road/center of the city ☐
52. 3	The area of higher official residents and the ordinary people			Higher official residents ☐	Ordinary people residents ☐
52. 4	The residential area and the commercial area			residential ☐	commercial ☐

53. Write any problem what you observe regarding to solid waste management/ disposal/ practice issues with comments for its improvement in Ambo _____

Appendix 14: Interview questions for the staff members

1. Profile of workers engaged in solid waste management sector

Code	**sex**			**Responsibility And year of experience**	**Condition of employment**						**qualification**		
	M	F	T		Permanent			Temporary			Level of Education	Specialization	Training, if any
					M	F	T	M	F	T			

2. Do you plan your work?
3. Does your department have specific job description for its employees?

   1/ yes 2/ No

   If No, what do you think the reason behind?
4. What is the source of your income for solid waste handling services?

   1/ budget from the federal government

   2/ fees collected from the services

   3/ budget from the Ambo city administration

   4/ please specify, if any other _____
5. Have you ever faced budget deficit?

   If Yes, from where did you get subsidy to solve such problem or?
6. What are the common HHSWM (household solid waste management) practices in the city of Ambo, particularly at household level?
7. Is solid waste disposing container available in different parts of the town?

   If Yes, do you believe that it is enough for the city's people?

   If No, what other means does your institution provide to the households in order to dispose their wastes appropriately?
8. Are the vehicles currently in use enough to dispose solid wastes in the town/
9. Have you ever give any orientation / information, which is related to HHSW, to the households?

10. How do you evaluate the problem of solid waste disposal practice in the town?

11. To what extent does the municipality regulate the process of waste disposal by the households?

12. Have you come across with solid waste thrown away in the town illegally?

If Yes, what measure did municipality take to penalize the regulation violators and to prevent such action in the future?

13. What kind of HHSWD practice you (municipality) expects from residential as effective management

14. Do you believe that the municipality provides adequate facility to the households?

15. Is there any private enterprise (cooperatives) that engaged in HHSWD services?

If Yes, have the municipality ever established any system for such enterprises (cooperative) to get training and consultation services with regard to:

a. how to collect and handle wastes from households
b. the extent of their responsibility

16. Do you have a follow – up form or criteria to know whether the private waste collectors discharge their responsibility as expected or not?

17. How do you evaluate the enforceability of rules and regulation of solid wastes in Ambo?

18. Do you believe that these private waste collectors are paid fees benefiting the service they render?

19. What effort is being made to improve HHSWM practice, with regard to:

A. the supply of enough facilities like containers, door-to-door collection services

B. encouraging households to apply waste separation at sources and

C. improves the understanding level of the households about waste management and the impact of inappropriate management / disposal.

20. List down all factors which you think can impede the household solid waste disposal services of the town that may raised from both household sides and municipality sides including its solution

Appendix 15: questions for focus group discussants

1. What was the ground for the establishment of your group for this activity and when was it begun?
2. What is the attitude of the households towards you?
3. How you discharge service payment for households
4. Is the payment for service fair (worth your services)
5. Have you faced any problems with the way you collect wastes
6. What is your suggestions to improve solid waste disposal system in the town